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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 17
SEPTEMBER 1, 1973

W73-010401 – W73-011050

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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VOLUME 6, NUMBER 17
SEPTEMBER 1, 1973

W73-010401 – W73-011050

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

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Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

CHEMICAL INTERACTIONS OF ALUMINUM WITH AQUEOUS SILICA AT 25 DEGREES C,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-10433

SODIUM AND MAGNESIUM SULFATE ION PAIRING: EVIDENCE FROM RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
F. P. Daly, C. W. Brown, and D. R. Kester.
Journal of Physical Chemistry, Vol 76, No 24, p 3664-3668, 1972. 2 fig, 3 tab, 31 ref. OWRR B-036-RI (2).

Descriptors: *Chemical analysis, *Aqueous solutions, *Spectroscopy, Electrolytes, Sodium, Magnesium, Sulfates, Hydrogen bonding, Ionization, Chemical reactions, Analytical techniques, Evaluation.

Raman spectra of aqueous solutions of sodium and magnesium sulfates were measured but failed to reveal any evidence of ion pairing. However, sulfate solutions with HCl added did exhibit relatively strong bands due to HSO4. Evidence for MgSO4 and NaSO4 ion pairs was obtained by the addition of sodium and magnesium salts to the latter solution; both cations compete with hydrogen ions for the SO4. This is clearly demonstrated in the Raman spectra by a decrease in intensity of the band assigned to HSO4 at 1,053 cm and an increase in intensity of the band assigned to SO4 at 982 cm in the solutions with sodium or magnesium added. (Woodard-USGS)
W73-10650

02. WATER CYCLE

2A. General

SYNTHESIS AND EVALUATION OF URBAN-REGIONAL HYDROLOGIC RAINFALL-RUNOFF CRITERIA,
Environmental Dynamics, Inc., Los Angeles, Calif.
J. A. Dracup, T. J. Fogarty, and S. G. Grant.
Available from the National Technical Information Service as PB-220 965, $3.00 in paper copy, $0.95 in microfiche. Completion Report, February 1973. 105 p, 9 fig, 5 tab, 48 ref, 2 append. OWRR C-2182 (3407) (1).

Descriptors: *Rainfall-runoff relationships, *Hydrologic models, Waterbeds (Basins), Model studies, *Hydrologic cycle, Runoff, Rainfall, *Mathematical models, Data collections, Research and development, Regional analysis.
Identifiers: *Urban watersheds, *Research application.

Mathematical models of the hydrologic rainfall-runoff process are applied, evaluated and compared, using data from urban and natural watersheds. Criteria are developed for use in the selection of an appropriate hydrologic rainfall-runoff model for specific watershed needs. This study is oriented specifically at closing the gap between research and its application by practicing engineers and hydrologists in the water resources field. New models are not developed, but the use of existing models is clarified through a selection display tableau and user oriented computer programs implementing a wide range of rainfall-runoff models.
W73-10416

THE INTERNATIONAL HYDROLOGICAL DECADE--A PRELIMINARY EVALUATION OF A COOPERATIVE EFFORT IN THE EARTH SCIENCE FIELD,
L. A. Heindl.
In: Earth Science Aid to Developing Countries, Second Symposium of the 24th International Geological Congress, Montreal: International Geological Congress, Ottawa, Canada, p 135-141, 1972. 6 ref.

Descriptors: *International Hydrologic Decade, *Reviews, *Hydrology, *Water resources development, Foreign countries, Programs, Evaluation, Conferences, Cooperatives, Organizations, Economics, Water demand, Water supply.
Identifiers: Developing countries, Earth sciences.

The International Hydrological Decade's central scientific effort is improving the scientific understanding of the world water balance. The decade program lists about 60 problem areas in which nations are encouraged to participate through national efforts and international cooperation and coordination. At the Mid-Decade Conference (December 1969) a majority of 75 nations represented, mostly developing countries, voted to concentrate the last five years of the Decade on practical aspects of hydrology of benefit to developing countries rather than to continue emphasis on scientific results--not that scientific programs were to be abandoned. Developing countries are not so much anti-science as they are for solving their growing practical problems. They favor those aspects of science with direct application in improving standards of living. They are satisfied to use advances made elsewhere or to gear their scientific programs to plug gaps in the research done elsewhere where this serves the national interest. The logical deductions seem to be that international scientific programs must be geared to the short- and long-term needs of the recipient country, rather than to the interests of the doner scientists, or of science per se. The development of a scientific capability in the natural resource field must be done within the framework of satisfying a developing country's practical and immediate needs. (Woodard-USGS)
W73-10424

WATER BALANCE IN SOVIET CENTRAL ASISA (VODNYY BALANS TERRITORII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), Ivanov, Yu. N., editor, Leningrad, 1972. 104 p.

Descriptors: *Water balance, *Precipitation (Atomospheric), *Runoff, *Evaporation, Transpiration, Temperature, Interception, Water loss, Water resources, Water quality, Soils, Soil moisture, Vegetation, Mountains, Lakes, Surfaces, Irrigation, Analytical techniques, Instrumentation, Measurement.
Identifiers: *USSR, *Soviet Central Asia, Isolines, Nomograms.

Various items in the water balance of Soviet Central Asia are investigated in this collection of 10 papers published by the Central Asian Hydrometeorological Scientific Research Institute at Tashkent. The influence of mountain topography on distribution of precipitation is examined, and a method is proposed for determining the amount of rainfall that is intercepted by vegetation. Studies are made of evaporation from free-water and soil surfaces, and water balances in large irrigatied areas of the Fergana Valley and Golodnaya steppe are compared. (See W73-10449 thru W73-10457) (Josefson-USGS)
W73-10448

SOME RESULTS AND WAYS OF DEVELOPING METHODS OF STREAMFLOW MEASUREMENT IN MOUNTAIN COUNTRIES (NEKOTORYYE ITOGI I PUTI RAZVITIYA SPOSOBOV RASCHETA STOKA V USLOVIYAKH GORNYKH STRAN),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 07B.
W73-10449

WATER RESOURCES OF MOUNTAIN LAKES IN SOVIET CENTRAL ASIA (VODNYYE RESURSY GORNYKH OZER SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02H.
W73-10450

EFFECTS OF OROGRAPHY ON DISTRIBUTION OF PRECIPITATION IN MOUNTAIN BASINS (VLIYANIYE NEKOTORYKH ELEMENTOV OROGRAFII NA RASPREDELENIYE OSADKOV V GORNYKH BASSEYNAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02B.
W73-10451

COMPUTATION OF MONTHLY SOLID PRECIPITATION FROM TOTAL MONTHLY PRECIPITATION AND AVERAGE MONTHLY AIR TEMPERATURE (RASCHET MESYACHNYKH SUMM TVERDYKH OSADKOV PO OBSHCHIM MESYACHNYM SUMMAM OSADKOV I SREDNIM MESYACHNYM ZNACHENIYAM TEMPERAT URY VOZDUKHA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W73-10452

INTERCEPTION OF PRECIPITATION BY VEGETATION AND ITS DETERMINATION IN WATER-BALANCE INVESTIGATIONS (PEREKHVAT ATMOSFERNYKH OSADKOV RASTITEL'NOST'YU I YEGO UCHET PRI VODNOBALANSOVYKH ISSLEDOVANIYAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02B.
W73-10453

EVAPORATION FROM FREE-WATER SURFACES IN SOVIET CENTRAL ASIA (ISPARENIYE A VODNOY POVERKHNOSTI V USLOVIYAKH SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W73-10454

SCHEME FOR MEASUREMENT OF EVAPORATION FROM SOIL SURFACES (SKHEMA RASCHETA ISPARENIYA S POVERKHNOSTI POCHVY),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02D.
W73-10455

WATER BALANCE AND RUNOFF LOSSES IN THE FERGANA VALLEY AND GOLODNAYA STEPPE (STRUKTURA VODNOGO BALANSA I POTERI RECHNOGO STOKA V FERGANSKOY DOLINE I GOLODNOY STEPI),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
F. E. Rubinova, and M. I. Getker.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 84-90, Leningrad, 1972. 2 tab, 10 ref.

Descriptors: *Water balance, *Water loss, *Runoff, *Evaporation, Transpiration, Return flow, Withdrawal, Irrigated land, Irrigation practices.
Identifiers: USSR, *Fergana Valley, *Golodnaya steppe.

An analysis is made of water balance in two regions where irrigation is accomplished under substantially different natural conditions. In the Fergana Valley, the increase in runoff losses to evaporation on 100,000 ha of newly reclaimed land was 0.55 cu km/yr, while in the Golodnaya steppe it was 0.86 cu km/yr. The total increase in runoff losses in the valley in 1935-65 (1.7 cu km/yr) was derived from increased transpiration (2.7 cu km/yr) and reduced direct evaporation from the soil (1.0 cu km/yr). In the Golodnaya steppe, transpiration and direct evaporation from the soil increased in the same period by 1.4 cu km/yr and 0.2 cu km/yr, respectively. In 1960-65, return flow in the valley was 46.5% of the water withdrawal, while in the steppe it was 23.5%. Expansion of irrigable land in both the valley and the steppe is expected to increase runoff losses by only 1.7 cu km/yr. (See also W73-10448) (Josefson-USGS)
W73-10456

SOME PROBLEMS IN THE WATER REGIMEN OF WEAKLY LEACHED CINNAMON-BROWN SOILS IN THE PARKENTSAY RIVER BASIN (NEKOTORYYE VOPROSY VODNOGO REZHIMA KORICHNEVYKH SLABOVYSHCHELOCHENNYKH POCHV BASSEYNA R. PARKENTSAY),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02G.
W73-10457

STOCHASTIC MODELS APPLIED TO OPERATION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
G. L. Curry, G. E. O'Connor, R. A. Clark, and J. C. Helm.
Available from the National Technical Information Service as PB-221 025, $3.00 in paper copy, $0.95 in microfiche. Technical Report 47, June 1973, 153 p, 21 fig, 16 tab, 78 ref. OWRR A-019-TEX (2). 14-31-0001-3844.

Descriptors: Weather modification, Optimization, *Reservoir operation, *Texas, Model studies, *Statistical models, *Simulation analysis, Precipitation (Atmospheric), *Meteorological data.
Identifiers: *Colorado River Basin (Tex), Concho River Basin (Tex), Linked reservoirs.

A hydrometeorological model (MOHS) is presented that utilized 30-day meteorological forecasts of temperature and precipitation issued every 15 days by the National Weather Service to provide an estimate of the future hydrometeorological conditions of a river basin. Use of the 30-day meteorological forecast categories of light, moderate, or heavy precipitation and below normal, near normal, or above normal temperature provide physical constraints upon quantitative values which were synthesized by a Monte-Carlo simulation technique. Estimates of monthly precipitation for meteorological stations semi-randomly located within the river basin are simulated from the square-root-normal distribution, while monthly mean data of ambient-air temperature are simulated using the Gaussian distribution. The forecast periods of temperature provided information that verified better than chance, but precipitation periods did not verify well. Contingency tables of forecast versus observed weather and conditional probabilities for each forecast category and period obtained. Three reservoirs located in the Concho River Basin in West Texas were also modeled and tested in this study. (Runkles-Tex A and M)
W73-10565

THE APPLICATION OF A SIMPLE RAINFALL--RUNOFF MODEL TO A CATCHMENT WITH INCOMPLETE DATA COVERAGE,
Swedish Meteorological and Hydrological Inst., Stockholm.
S. Bergstrom.
Sveriges Meteorologiska och Hydrologiska Institut, Notiser och preliminara rapporter, Serie Hydrologi, No 26, 1972. 25 p, 16 fig, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Data processing, Data collections, Simulation analysis, Streamflow forecasting, Runoff forecasting.
Identifiers: *Sweden.

A rainfall-runoff model was designed to yield reasonable results with few observed variables and with simple evaluation of parameters. Input is daily values of rainfall and monthly values of the potential evaporation. Output is daily values of discharge. Many well known physical processes are deliberately left out of the model as their contribution to the complexity is not justified by the improvement of the results. Other processes are simplified and differ from the known reality in order to limit the number of parameters to optimize. The model can be used as a forecasting tool even in a poorly covered catchment. The simplicity of the model makes a rough parameter evaluation extremely easy and limits the demand of computer time. (Knapp-USGS)
W73-10656

GEOHYDROLOGIC STUDY OF THE GORT LOWLAND AND ADJACENT AREAS OF WESTERN IRELAND USING ENVIRONMENTAL ISOTOPES,
Ceylon Univ., Peradeniya.
For primary bibliographic entry see Field 02F.
W73-10660

STREAM BASEFLOW PREDICTION BY CONVOLUTION OF ANTECEDENT RAINFALL EFFECTS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, and J. Borrelli.
Water Resources Bulletin, Vol 9, No 2, p 360-365, April 1973. 6 ref.

Descriptors: *Base flow, *Mathematical models, *Synthetic hydrology, Low flow, Simulation analysis, Surface-groundwater relationships, Streamflow forecasting, Antecedent precipitation.

Stream baseflow prediction is based on a parallel drain theory and convolution techniques. The infiltrating portions of several rain events are superimposed on the groundwater reserves and allowed to drain to the stream as individual baseflow responses. The convolution technique sums the contributions from each rain event to the stream to give the total baseflow at any point in time. A single lumped parameter from a parallel drain analogy represents the physical characteristics of a watershed. This parameter determines the time delay between a rainfall event and the resulting baseflow response. The procedure was applied to data from five watersheds. A 1-year data collection was used to find the best-fitting runoff delay coefficient, thus calibrating the response function which was subsequently applied to 2 test years to predict a dry-weather low-flow sequence. The agreement between predicted and observed flows was reasonably good, but marred by frequent minor rainfalls during the chosen dry periods. The application of the method should be much more successful in the western states where prolonged dry periods are common. (Knapp-USGS)
W73-10675

SHELF SEDIMENT TRANSPORT: A PROBABILITY MODEL,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 02J.
W73-10755

HYDROLOGY AND WATER RESOURCES IN ARIZONA AND THE SOUTHWEST, VOLUME 2.

Proceedings of the 1972 Meetings of the Arizona Section-American Water Resources Association and the Hydrology Section-Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona. (1972). 491 p.

Descriptors: *Hydrology, *Water resources, *Publication, *Arizona, *Southwest US, Arid lands, Research and development, Hydrologic cycle, Groundwater, Snowpacks, Information retrieval, Water management (Applied), Streamflow, Water quality, Water pollution, Weather modification, Water quality control, Nitrogen cycles, Decision making, Data transmission, Flood forecasting, Rainfall, Ephemeral streams.
Identifiers: Collective utility.

Presented are 28 papers by 42 university professors, government scientists, consultants, and graduate students interested in arid lands hydrology and water resources as applied to Arizona and the Southwest. The collection represents a review of the status of hydrologic research interests in this region. Topics include Colorado River trips, hydrology as a science, snowpack relationships, information systems, management attitudes, groundwater supply, subsidence, groundwater contamination, transmissivity distribution, seepage control, evaporation, legal aspects of urban runoff, watershed management to increase streamflow, weather modification, water pollution, collective utility, grass and soil filtration of runoff, nitrogen transformations of sewage effluent, turfgrass-soil system filters, stochastic decision models, data analysis, small sample bias in flood estimation, rainfall probability models, antecedent soil moisture relations, transition probabilities of monthly flow, flood routing models for ephemeral channels, bed material characteristics and transmission losses in ephemeral streams, and water disposition in ephemeral channels. (See W73-10819 thru W73-10846) (Popkin-Arizona)
W73-10818

HYDROLOGIC MODELING, PARAMETER ESTIMATION, AND WATERSHED CHARACTERISTICS,
Georgia Inst. of Tech., Atlanta.
L. D. James.
Journal of Hydrology, Vol 17, No 4, p 283-307, December 1972. 4 fig, 4 tab, 18 ref. OWRR C-1282 (No 1964) (6).

Descriptors: *Mathematical models, *Rainfall-runoff relationships, *Computer programs, *Urban

hydrology, Streamflow forecasting, Water yield, Simulation analysis, Water balance, Hydrologic budget, Urbanization.
Identifiers: *Stanford Watershed Model.

A general watershed model represents the runoff phase of the hydrologic cycle by a series of moisture accounting equations. The Stanford Watershed Model uses fixed equations containing variable parameters which are calibrated for a watershed by trial-and-error matching of simulated to recorded flows. Opset, a self-calibrating watershed model, was developed to estimate these parameters through a computerized least squares matching. The procedure reduces estimating scatter and provides parameter estimates which may be correlated with physical characteristics of the watershed and with watershed changes with urbanization. (Knapp-USGS)
W73-10964

NONLINEAR EQUATION OF UNSTEADY GROUNDWATER FLOW,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02F.
W73-10965

2B. Precipitation

PEATMOS PROBABILITY OF PRECIPITATION FORECASTS AS AN AID IN PREDICTING PRECIPITATION AMOUNTS,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman.
Available from NTIS, Springfield, Va. 22151 as COM-73-10243 Price $3.00 printed copy; $0.95 microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWS ER-50, December 1972. 12 p, 6 tab, 4 ref.

Descriptors: *Precipitation (Atmospheric), *Forecasting, *Precipitation intensity, *Probable maximum precipitation, Mathematical studies, Precipitation gages, Data collections, Equations, Analytical techniques, United States, Geographical regions.
Identifiers: *Precipitation amounts forecasting, Eastern United States.

The National Weather Service has developed a method of using Primitive Equation and Trajectory Model Output Statistics (PEATMOS) for determining the probability of precipitation (PoP) equal to or exceeding 0.01 inch in specified 12-hour periods. In this study the frequency of occurrence of 12-hour precipitation amounts exceeding other specified quantities in addition to 0.01 inch is determined as a function of the PEATMOS PoP. Data were collected for 13 different cities in the eastern United States. The 13 cities were chosen solely on the availability of data in a form suitable for computer processing. Single city results are preferable to results for grouped cities, but the limited amount of data available for each city required that the data be pooled. The cities were grouped according to similarity of PEATMOS PoP equations. Stations in groups 1 and 2 have identical PEATMOS PoP equations but were separated further according to geographic location. Group 1 represents the Northeast and group 2 represents the Southeast United States. The data are tabulated. (Woodard-USGS)
W73-10426

WATER BALANCE IN SOVIET CENTRAL ASISA (VODNYY BALANS TERRITORII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02A.
W73-10448

EFFECTS OF OROGRAPHY ON DISTRIBUTION OF PRECIPITATION IN MOUNTAIN BASINS (VLIYANIYE NEKOTORYKH ELEMENTOV OROGRAFII NA RASPREDELENIYE OSADKOV V GORNYKH BASSEYNAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
M. I. Getker, G. Ye. Glazyrin, and Yu. N. Yemel'yanov.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel;skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 30-38, Leningrad, 1972. 3 fig, 3 tab, 10 ref.

Descriptors: *Precipitation (Atmospheric), *Rainfall disposition, *Orography, *Mountains, *River basins, Valleys, Slopes, Elevation, Correlation analysis.
Identifiers: USSR.

For exposed, favorably oriented valleys, the coefficients of correlation of monthly and annual precipitation with distance from the divides defining the valleys are larger than those for absolute elevation. An analysis of residual coefficients of correlation of precipitation with distance, when the effects of absolute elevation are removed, shows the importance of considering these indices in precipitation estimates. For October-May, when most of the annual precipitation occurs, the residual coefficients of correlation vary between 0.40 and 0.90 for the Surkhandar'ya, Akhangaran, and Talas River valleys. (See also W73-10448) (Josefson-USGS)
W73-10451

COMPUTATION OF MONTHLY SOLID PRECIPITATION FROM TOTAL MONTHLY PRECIPITATION AND AVERAGE MONTHLY AIR TEMPERATURE (RASCHET MESYACHNYKH SUMM TVERDYKH OSADKOV PO OBSHCHIM MESYACHNYM SUMMAM OSADKOV I SREDNIM MESYACHNYM ZNACHENIYAM TEMPERAT URY VOZDUKHA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02C.
W73-10452

INTERCEPTION OF PRECIPITATION BY VEGETATION AND ITS DETERMINATION IN WATER-BALANCE INVESTIGATIONS (PEREKHVAT ATMOSFERNYKH OSADKOV RASTITEL'NOST'YU I YEGO UCHET PRI VODNOBALANSOVYKH ISSLEDOVANIYAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
L. N. Poberezhskiy, and G. N. Trofimov.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 46-53, Leningrad, 1972. 1 fig, 2 tab, 16 ref.

Descriptors: *Precipitation (Atmospheric), *Interception, *Vegetation, Vegetation effects, Soil surfaces, Wetting, Water loss, Rainfall intensity, Wind velocity, Trees, Grasses, Shrubs, On-site investigations, Equations, Hydrographs.
Identifiers: USSR, *Uzbekistan, Nomograms.

Field experiments were conducted in Uzbekistan to determine maximum depth of wetting of trees, grasses, and shrubs. Rainfall intensity and duration and wind velocity had no effect on the amount of precipitation intercepted by vegetal cover. Precipitation losses by interception were computed for a wheat field in the Samarkand Oblast and for different species of vegetation in the Parkentsay River basin. (See also W73-10448) (Josefson-USGS)
W73-10453

STOCHASTIC MODELS APPLIED TO OPERATION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 02A.
W73-10565

DISCONTINUITY IN EARLY MORNING EVAPORATION,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 02D.
W73-10672

DEVELOPMENT OF DESIGN STORM HYETOGRAPHS FOR CINCINNATI, OHIO,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
H. C. Preul, and C. N. Papadakis.
Water Resources Bulletin, Vol 9, No 2, p 291-300, April 1973. 4 fig, 4 tab, 7 ref. EPA-WQ Research Grant 11024 DQU.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Hyetographs, *Design storm, *Ohio, Urban runoff, Storm runoff, Urban drainage, Mathematical models, Model studies, Simulation analysis, Depth-area-duration analysis.
Identifiers: *Cincinnati (Ohio).

A synthetic storm rainfall hyetograph for a one-year design frequency was derived from the one-year intensity-duration curve for Cincinnati, Ohio. Detailed rainfall data for a 3-year period were collected from three rain gages in the Bloody Run Sewer Watershed, an urban drainage area of 2,380 acres. The synthetic storm pattern is obtained from an analysis of the antecedent precipitation immediately preceding the maximum period of three selected durations. Only rains which produced excessive runoff were considered. The same approach can be used for other design frequencies. The purpose of this study is to provide synthetic storm hyetographs to be used as input in deterministic mathematical models simulating urban storm water runoff for the design, analysis, and possible surcharge prediction of sewer systems. (Knapp-USGS)
W73-10679

DISTRIBUTION OF MORE IMPORTANT COMPLEX BIOMETEOROLOGICAL INDICES OVER THE GLOBE,
M. Gregorczuk.
Ekol Pol. Vol 19, No 45, p 745-787. 1971. Illus.
Identifiers: *Distribution patterns (Temperature), Indices, *Meteorological data, Pressure, Temperature.

On the basis of data on air temperature, water vapor pressure, wind velocity, and solar radiation, calculation is presented on the spatial distribution of more important complex biometeorological indices over the globe; dry and wet cooling power calculated according to Siple and Hill's formulae, 3 varieties of effective temperatures, and the index of thermal effect of solar radiation. The spatial distribution of more important components of wet cooling and effective temperatures are also presented.—Copyright 1973, Biological Abstracts, Inc.
W73-10816

HYDROLOGY AND WATER RESOURCES IN ARIZONA AND THE SOUTHWEST, VOLUME 2.
For primary bibliographic entry see Field 02A.
W73-10818

THE CONSTRUCTION OF A PROBABILITY DISTRIBUTION FOR RAINFALL ON A WATERSHED BY SIMULATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

G. Williamson, and D. R. Davis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 369-383. (1972). 4 fig, 1 tab, 6 ref. OWRR C-3259 (3708) (2).

Descriptors: *Probability, *Distribution patterns, *Rainfall, *Simulation analysis, *Model studies, Watersheds (Basins), Rain gages, Storms, Density.

The relations between a rain gage reading and its location, the storm location and height, and the areal rain on the watershed are considered in an effort to determine a probability distribution for the areal rainfall on the watershed, given the rain gage reading at a point. When the number of rain gages on or near a watershed is small, the estimate of areal rainfall may be in considerable error, especially if the rainfall event is a thunderstorm. A rain gage reading may be viewed as a sample, since the amount of areal rainfall on a watershed can vary between extremely wide limits while the point rainfall over a single gage remains constant. The model described here attempts to simulate the interaction among variables of rain gage readings and location, and storm location, by choosing a random location and height for a storm from some probability density function; determine the rain gage reading given the distance from gage to storm center; and determine the average rainfall on the watershed. Results demonstrate that a rainfall model may be broken into segments and implemented by computer to develop probability density functions for areal rainfall, given the rain gage reading and storm location. The criteria of minimum expected variance can then be used to find the optimum gage location. (See also W73-10818) (Paylore-Arizona)
W73-10842

2C. Snow, Ice, and Frost

GUIDE TO WORLD INVENTORY OF SEA, LAKE AND RIVER ICE.
UNESCO--IASH Contribution to International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 9, 1972. 23 p, 3 fig, 2 tab, 25 ref.

Descriptors: *Ice cover, *Surface waters, *Ice-water interfaces, Measurement, Methodology, Depth, Volume, Iced lakes, Rivers, Sea ice, International Hydrological Decade.
Identifiers: *Ice inventory methods.

The only technique recommended in this guide for measuring ice thickness on bodies of water is direct measurement through a hole in the ice cover. One possible exception is a probe developed by the Defence Research Board of Canada (Houle, 1961). It consists of a long plastic tube through the wall in which sealed bare wire electrodes are spaced 1 cm apart. Each electrode has a separate lead to the top end of the tube. The tube is filled with a resin whose thermal conductivity about matches that of ice. The tube is frozen into the ice cover at the beginning of the season in a vertical position with the top projecting. A measurement consists of observing the resistance between successive pairs of electrodes until a significant change in resistance occurs. The ice-water interface is thus located within an accuracy of about 1 cm. This device works well in freshwater, but has proved unsuitable in seawater. Also described are methods of measuring the areal extent and volume of ice over bodies of water. (Woodard-USGS)
W73-10427

SNOW STUDIES USING THERMAL INFRARED MEASUREMENTS FROM EARTH SATELLITES,
Environmental Research and Technology, Inc., Lexington, Mass.
J. C. Barnes, and C. J. Bowley.
Available from NTIS, Springfield, Va. 22151 as COM-72 11424 Price $3.00 printed copy; $0.95 microfiche. Allied Research Associates, Inc, Final Contract Report 8G92-F, July 1972. 112 p, 17 fig, 14 tab, 17 ref. NOAA-ESS Contract 1-35350.

Descriptors: *Remote sensing, *Snow survey, *Snowmelt, *Runoff forecasting, *Water yield, Snow, Infrared radiation, Satellites (Artificial), Calibrations, Instrumentation, Temperature, Surveys, Mapping.

Satellite thermal infrared measurements were studied for mapping snow cover using Nimbus and ITOS imagery and digitized data. The measurements were correlated with snow distributions mapped from satellite photographs and snow reports for both relatively flat terrain and mountainous areas of the United States. Thermal IR measurements can be a useful tool for mapping snow-cover extent, particularly in relatively flat terrain. In IR imagery, snow-covered areas are usually depicted by significantly brighter tones (lower temperatures) than the surrounding snow-free terrain. Digitized data show that areas with snow cover have IR temperatures, on the average, 5 to 10 deg K lower than areas with no snow. The spatial resolution of existing radiometers is marginal for mapping snow with the accuracy desired for many hydrologic applications, and in mountainous areas IR temperature measurements are influenced by terrain elevation regardless of the snow distribution. Also, IR temperatures measured over snow during the spring months can be considerably higher than the value that would be expected for a melting snow surface. Calibration problems alone cannot account for the apparent discrepancy. The relatively high IR temperatures are believed to be primarily the result of the radiometer viewing warmer surfaces, such as trees or bare rock, in addition to the melting snow field. (Knapp-USGS)
W73-10435

COMPUTATION OF MONTHLY SOLID PRECIPITATION FROM TOTAL MONTHLY PRECIPITATION AND AVERAGE MONTHLY AIR TEMPERATURE (RASCHET MESYACHNYKH SUMM TVERDYKH OSADKOV PO OBSHCHIM MESYACHNYM SUMMAM OSADKOV I SREDNIM MESYACHNYM ZNACHENIYAM TEMPERAT URY VOZDUKHA),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
M. I. Getker, G. Ye. Glazyrin, and Yu. N. Yemel'yanov.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 39-45, Leningrad, 1972. 2 fig, 1 ref.

Descriptors: *Snow, *Precipitation (Atmospheric), *Air temperature, *Monthly, *Average, Precipitation gages, Probability, Equations, Curves.
Identifiers: USSR.

A probability method for computing monthly solid precipitation was based on total monthly precipitation measured by a precipitation gage and average monthly air temperature at the gaging site. The method was tested for six meteorological stations at different elevations and under different conditions. The results of computations were satisfactory. (See also W73-10448) (Josefson-USGS)
W73-10452

INTERNAL FRICTION OF SINGLE-CRYSTAL ICE,
Regions Research and Engineering Lab., Hanover, N.H.
J. P. Van Devender, and K. Itagaki.
Research Report 243, March 1973. 39 p, 12 fig, 2 tab, 32 ref, append.

Descriptors: *Ice, *Crystals, *Friction, Analytical techniques, Irradiation, Temperature, Data collections, Correlation analysis, Curves, Plastic deformation.
Identifiers: Single-crystal ice, Internal friction, Scratching.

The internal friction of single-crystal ice was investigated for the amplitude-independent regime and the results interpreted in terms of the prevailing theories. The study was motivated by a combination of questions raised by other experimenters. Their results were correlated with the results of these experiments to advance understanding of internal friction in dielectrics (most internal friction studies have been on metals) and the peculiar relationship between dielectric and mechanical relaxation in ice. The two theories for internal friction in ice were also tested. In addition, the effects of mechanical straining and X-irradiation on damping were studied to reveal the loss mechanism. The effects observed on the internal friction of pure, single-crystal ice, in the flexure mode of oscillation between 400 and 1400 Hz, supported the existence of a dislocation-controlled mechanism, with the drag produced by the interaction of the dislocation with the protons in the crystal. (Woodard-USGS)
W73-10652

PREDICTING DEGREE DAY SNOW MELT FACTORS WITH CROWN CLOSURE IN ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02E.
W73-10697

ABLATION ON GLACIERS IN SOVIET CENTRAL ASIA (ABLYATSIYA LEDNIKOV SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. G. Konovalov.
Sredneaziatskiy Regional'nyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 8 (89), Leningrad, 1972. 159 p.

Descriptors: *Glaciers, *Ablation, Melting, Ice, Snow, Snowmelt, Evaporation, Heat balance, Heat flow, Temperature, Climatology, Radiation, Cloud cover, Runoff, Glacial drift, Mountains, Elevation, Regulation, Measurement, Equations.
Identifiers: USSR, *Soviet Central Asia, Heat exchange, Glacier tongues, Bowen ratio.

Measurement of heat balance on the surface of glaciers in Soviet Central Asia during the ablation season is described. Intensity and duration of ablation on glaciers are examined, and a method is developed for making computations from laboratory analyses to determine losses in heat sustained by ablation. An analysis is made of the correlation between ablation and air temperature and of the problem of artificial regulation of mountain glacier runoff. (Josefson-USGS)
W73-10778

AN ANALYSIS OF YEARLY DIFFERENCES IN SNOWPACK INVENTORY PREDICTION RELATIONSHIPS,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. F. Ffolliott, D. B. Thorud, and R. W. Enz.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 31-42, (1972). 3 fig, 2 tab, 7 ref. OWRR A-029-ARIZ (6).

Descriptors: *Analysis, *Snow cover, *Forest watersheds, *Vegetation effects, *Water yield, Rainfall-runoff relationships, Ponderosa pine trees, Regression analysis, Statistical methods, Moisture content, Seasonal, Snow surveys, Arizona, *Snowpack.

Inventory-prediction relationships between snowpack conditions and forest attributes may be useful in estimating water yields derived from snow, but such relationships are developed usually from source data collected over a short time period. Analyses of long-term data suggest inventory-prediction relationships developed from limited data may have more general application, however. Available records from 18 snow courses in the ponderosa pine type in Arizona provided source data in this study, which was designed to empirically analyze inventory-prediction relationships developed from long-term Snow Survey records. The primary hypothesis tested in the study, and evaluated by statistically analyzing the family of regression equations representing a snow course, was that, given a precipitation input, the distribution of snowpack water equivalent at peak seasonal accumulation is determined by the spatial arrangement of the forest cover, e.g. basal area. Generally 12 of the 18 snow courses evaluated appeared to support the hypothesis, three courses did not, and three courses were considered inconclusive. (See also W73-10818) (White-Arizona)
W73-10821

A SEARCH: NEW TECHNOLOGY FOR PAVEMENT SNOW AND ICE CONTROL,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W73-10883

BIOLOGICAL PRODUCTIVITY OF LAKES KRIVOE AND KRUGLOE,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Instut.
For primary bibliographic entry see Field 05C.
W73-10896

THE CHAR LAKE PROJECT. A STUDY OF ENERGY FLOW IN A HIGH ARCTIC LAKE,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10904

STRUCTURE OF A MULTI-YEAR PRESSURE RIDGE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Kovacs, W. F. Weeks, S. Ackley, and W. D. Hibler, III.
Arctic, Vol 26, No 1, p 22-31, March 1973. 9 fig, 12 ref.

Descriptors: *Sea ice, *Ice cover, *Navigation, *Ice, Arctic, Profiles.
Identifiers: *Pressure ridges.

Three traverse profiles were measured across a large pressure ridge in the Beaufort Sea. The ridge sail extended 4 m above sea level and the ridge keel 13 m below. The cross-sections of the ridge keel can be described as roughly semicircular. This suggests that form drag coefficients for flow transverse to the long axes of multiyear ridges may be as high as 0.8. Much of the ice in the ridge has a very low salinity and is quite strong. All the interblock voids that initially existed in the ridge at the time of formation have been completely filled with ice. Multiyear ridges are significant obstacles to even the largest icebreaking ship and should be avoided if possible. A very large first-year ridge with a sail height of 12.8 m is also described. This is the largest free-floating ridge yet measured. (Knapp-USGS)
W73-10974

FIELD EXPERIMENTS ON FREEZING AND THAWING AT 3.350 METERS IN THE ROCKY MOUNTAINS OF COLORADO, U.S.A.,
Universidad Nacional del Sur, Bahia Blanca (Argentina).
A. E. Corte, and A. O. Poulin.
In: Research Methods in Pleistocene Geomorphology; Proceedings of 2nd Symposium on Geomorphology, Summer 1971, Guelph, Ontario, Canada: Guelph University Publication, p 1-25, 1972. 12 fig, 1 tab.

Descriptors: *Freezing, *Thawing, *Frost action, *Alpine, *Mapping, Permafrost, *Colorado, Frost heaving, Frozen ground, Soil water, On-site tests, On-site data collections, Photogrammetry, *Rocky Mountain Region.

In the Rocky Mountains of Colorado above 3.300 meters (over the timber line) some large sorted features are similar to those of the polar regions. Similar sorted features are found at the bottom of shallow lakes well below the timber line. These features were studied to find whether they are active or inactive and related to permafrost of the last glacial event. A field experiment was started in 1959 and controlled every year until 1966 by means of stereophotographs. Three soil types were selected for the test: a clean sandy gravel; a well graded sandy gravel; and a very dirty sand gravel. A small reservoir was built to provide water for saturating the soil. Measurements of surface motions were made photogrammetrically. The area without fines did not develop horizontal sorting. The surface in 1966 was coarser than in 1960. The areas with 7% and 18% fines showed circular depressions in 1960 and 1962 produced by animal tracks or by collapse. Sorting into these depressions occurred for a year after their appearance and then ceased. (Knapp-USGS)
W73-10976

COMPARISON OF FLAME AND FLAMELESS ATOMIC ABSORPTION FOR THE DETERMINATION OF CALCIUM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02K.
W73-11037

2D. Evaporation and Transpiration

FREQUENCY ANALYSES OF THE RATIO OF ACTUAL TO POTENTIAL EVAPOTRANSPIRATION FOR THE STUDY OF CLIMATE AND VEGETATION RELATIONSHIPS,
Louisiana State Univ., New Orleans.
R. A. Muller.
Proceedings of the Association of American Geographers, Vol 3, p 118-122, 1971. 1 fig, 1 tab, 10 ref.

Descriptors: *Evapotranspiration, *Water balance, *Soil-water-plant relationships, *Climates, Vegetation, Frequency analysis, Analytical techniques, Model studies, Computer programs, Environmental effects, Correlation analysis, Hydrologic cycle.
Identifiers: *Actual evapotranspiration, *Potential evapotranspiration.

The application of frequency analyses is described for Thornthwaite water balance components instead of average climatic data for environmental studies. The spatial representativeness of water balance data and the relation of the index of moisture to average climatic data are considered. Monthly, seasonal, and annual frequency analyses of the ratio of actual to potential evapotranspiration (AE/PE) are introduced by four examples for comparative regional studies of relationships between climate and vegetation. These examples of AE/PE ratios are presented with the intention of encouraging further interest in the relationships among frequencies of hydroclimatic eomponents of the water balance models and environmental consequences. The water balance models are simplified descriptions of the very complex hydrologic cycle. Yet the simple models can provide hypothetical continental systems to which real world phenomena can be compared. (Woodard-USGS)
W73-10421

ANALYSIS OF WATER CONSUMPTION OF VARIOUS GRAPE CULTIVARS,
Levi Eshkol School of Agriculture, Jerusalem (Israel).
B. Bravdo, S. Lavee, and R. M. Samish.
Vitis. Vol 10, No 4, p 279-291, 1972. Illus.
Identifiers: Gasometric methods, *Grape cultiven, Gravimetric methods, *Transpiration, Vitis-vinifera, *Water utilization.

The efficiency of water use (transpiration ratio) was investigated in various cultivars of grape (Vitis vinifera) by gravimetric and gasometric methods. Results of gravimetric measurements showed positive correlation between water use efficiency and vigor. Regression lines of the transpiration ratio on the final dry weight differed significantly in their curves and their distance from the coordinate axes. Statistical analysis showed that the quantitative effect of vigor on the water use efficiency was smaller in the cv. 'Muscat Hamburg' than in 'Sultanina' and 'Queen of the Vineyards.' Covariance analysis showed that 'Sultanina' was a less efficient water user than 'Queen of the Vineyards' for plants with the same vigor. Gasometric methods revealed no significant differences between the cultivars, probably due to the elimination of interference and boundary layer resistance effect.--Copyright 1973, Biological Abstracts, Inc.
W73-10440

EVAPORATION FROM FREE-WATER SURFACES IN SOVIET CENTRAL ASIA (ISPARENIYE A VODNOY POVERKHNOSTI V USLOVIYAKH SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. N. Reyzvikh, and A. B. Popova.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 57-74, Leningrad, 1972. 4 fig, 8 tab, 9 ref.

Descriptors: *Evaporation, *Surfaces, *Measurement, *Evaporation pans, Temperature, Vapor pressure, Humidity, Wind velocity, Elevation, Equations.
Identifiers: USSR, *Soviet Central Asia.

Measurement of evaporation from free-water surfaces in Soviet Central Asia is currently based on use of eight 20-sq-m-circular tanks, 52 GGI-3,000 land pans, and 9 GGI-3,000 floating pans. Fifty-six percent of the instruments are located in lowland regions, 21.1% in the piedmont zone, and only 7.3% in areas at altitudes above 2,000 m. Observational periods range from 11 to 15 years for 31% of all evaporation stations, from 6 to 10 years for 40% of the stations, and are less then 5 years for the remaining 29% of the stations. Emipirical equations presently used to estimate evaporation from free-water surfaces are analyzed, and a regional formula is developed to measure evaporation from water areas in Soviet Central Asia. (See also W73-10448) (Josefson-USGS)

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

W73-10454

SCHEME FOR MEASUREMENT OF EVAPORATION FROM SOIL SURFACES (SKHEMA RASCHETA ISPARENIYA S POVERKHNOSTI POCHVY),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
A. I. Sergeyev.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 75-83, Leningrad, 1972. 1 fig, 7 ref.

Descriptors: *Measurement, *Evaporation, *Soil surfaces, Air-earth interfaces, Air-water interfaces, Temperature, Vapor pressure, Boundary processes, Equations.
Identifiers: USSR.

A mathematical scheme for measurement of evaporation is based on solution of a stationary problem for the soil-air system at equilibrium soil-moisture distribution. Equations are derived for calculating temperature distribution and vapor density by soil depth and for determining temperature and vapor pressure at the soil surface. Formulas derived for temperature and vapor pressure are based on data obtained from a network of meteorological stations. (See also W73-10448) (Josefson-USGS)
W73-10455

DISCONTINUITY IN EARLY MORNING EVAPORATION,
Calgary Univ., Alberta. Dept. of Geography.
L. C. Nkemdirim, and P. F. Haley.
Water Resources Bulletin, Vol 9, No 2, p 376-380, April 1973. 1 fig, 1 tab.

Descriptors: *Evaporation, *Meteorology, Humidity, Weather, *Canada, Winds, Solar radiation, Air-earth interfaces, Boundary processes.
Identifiers: *Calgary (Alberta).

A sudden jump was found in evaporation at Calgary, Canada from zero shortly after sunrise to a peak about an hour later and an equally dramatic return to zero occurred in another hour before proceeding in its normal course through the day. The most important atmospheric features involved were the presence at the one to two meter level during the early hours of either superadiabatic conditions or strong inversion conditions. The lapse condition usually followed after a night of strong inversion at this layer and corresponds to the initial surface heating shortly after sunrise. The requirements for sudden jumps in early morning evaporation seemed to be: sufficient soil moisture to maintain evaporation at or near the potential rate during the preceding day; low windspeed; and isothermal or inversion profile in the lower air layer followed by an abrupt change in the temperature profile to lapse condition shortly after sunrise, convectional activity, saturation of the lower air layer, and return to neutral or inversion profile. (Knapp-USGS)
W73-10672

DETERMINATION OF EVAPORATION OF WATER FROM ARID LOESS SOILS DURING NIGHTLY TEMPERATURE INVERSION PHASE BY TRITIUM-LABELING OF PREDETERMINED SOIL LAYERS,
W. Kuehn, M. Elmdust, and M. Evenari.
Kerntechnik. Vol 14, No 2, p 56-60. 1972. Illus. In German also.
Identifiers: Arid lands, *Evaporation, Layers, *Loess soils, Soil layers, Soils, Temperature inversion, Tritium, *Soil moisture.

The loss of moisture is limited to the first few centimeters nearest the surface. Owing to temperature inversions, there must be diffusion of water vapor from soil layers at a depth of about 40 cm towards the surface, but this vapor probably condenses in the cooler layers higher up.—Copyright 1973, Biological Abstracts, Inc.
W73-10802

COLOR IT EVAPORATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. J. Dvoracek.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 153-167, (1972). 7 fig, 1 tab, 5 ref.

Descriptors: *Evaporation, *Hydrologic properties, *Color, *Sewage, *Runoff, Radiation, Adsorption, Air temperatures, Texas, Arid lands.

Evaporation is a major hydrologic process in arid and semiarid lands. A brief review of evaporation literature indicates that a unique parameter, color, is desirable. Artificially colored water was used in a west Texas experiment to monitor evaporation rate and to note the effect of color on evaporation. Artificially green water had a higher evaporation rate than sewage and runoff. Five different colored waters were studied from 1966 to 1970. Color seems to affect the amount of adsorbed radiation as well as the extent of black radiation. The trend for a higher daily rate of evaporation existed for colored waters except during periods of low air temperature. Seven graphs are presented to support these conclusions. (See also W73-10818) (Popkin-Arizona)
W73-10829

COMPUTING EVAPOTRANSPIRATION BY GEOSTROPHIC DRAG CONCEPT,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
J. A. Mawdsley, and W. Brutsaert.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9483, p 99-110, January 1973. 4 fig, 3 tab, 27 ref, append. OWRR A-036-NY (1).

Descriptors: *Evapotranspiration, *Evaporation, *Air-earth interfaces, *Drag, Hydrodynamics, Humidity, Temperature, Mass transfer, Diffusion, Boundary layers, Turbulent boundary layers, Boundary processes, Shear drag.
Identifiers: *Geostrophic wind, *Geostrophic drag.

A procedure is given for computing regional evapotranspiration. The assumptions underlying the model are essentially those used in the one-dimensional mass-transfer methods, but the shear stress is determined by means of the density of the air, the geostrophic drag coefficient, and the surface geostrophic wind. The main advantage of the method is that all data needed in the computation (the surface temperature, the pressure of the air, the specific humidity at two levels in the atmospheric boundary layer, and the surface geostrophic wind speed) can be obtained from standard meteorological data. Generally, good agreement was obtained between mean monthly evapotranspiration computed for a number of stations and the corresponding evaporation data obtained from Class-A pans. (Knapp-USGS)
W73-10970

2E. Streamflow and Runoff

A FINITE ELEMENT SOLUTION FOR TWO--DIMENSIONAL DENSITY STRATIFIED FLOW,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 02H.
W73-10418

NONLINEAR STABILITY OF PLANE POISEUILLE FLOW OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
K. C. Porteus, and M. M. Denn.
Transactions of the Society of Rheology, Vol 16, No 2, p 309-319, 1972. 7 fig, 11 ref. OWRR A-009-DEL (6).

Descriptors: *Rheology, *Critical flow, *Laminar flow, *Turbulent flow, Reynolds number, Viscosity.
Identifiers: Viscoelastic fluids.

The stability of plane Poiseuille flow to finite disturbances was studied for the second order fluid using the cascade method. The analysis was carried out for elasticity numbers up to 0.0001. In this range the Deborah number based upon disturbance propagation is small and the use of a second order fluid model is consistent. In contrast to linear theory in this region, elasticity has a stabilizing effect on finite disturbances relative to the Newtonian liquid, and the difference between stability behavior of Newtonian and slightly elastic liquids tends to disappear. (Knapp-USGS)
W73-10428

TIDAL CURRENT ASYMMETRIES OVER THE NORFOLK SANDBANKS,
Cambridge Univ., (England). Dept. of Applied Mathematics and Theoretical Physics.
J. M. Huthnance.
Estuarine and Coastal Marine Science, Vol 1, No 1, p 89-99, January 1973. 3 fig, 2 tab, 8 ref.

Descriptors: *Tides, *Currents (Water), *Shoals, *Waves (Water), *Coriolis force, Sand waves, Sand bars, Water circulation, Topography, Tidal waters, Mathematical models.
Identifiers: *Norfolk Sandbanks (England).

A model for oscillatory tidal flow over parallel topography suggests that the Coriolis force and bottom drag are each responsible for distinct mechanisms of mean-current generation. A clockwise mean-current circulation was predicted and confirmed by data collected at the Norfolk Sandbanks, England. (Knapp-USGS)
W73-10430

THE SIGNIFICANCE OF WAVE PARAMETERS IN THE SORTING OF BEACH PEBBLES,
Unit of Coastal Sedimentation, Taunton (England).
For primary bibliographic entry see Field 02J.
W73-10431

RUNOFF CHARACTERISTICS OF CALIFORNIA STREAMS,
Geological Survey, Washington, D.C.
S. E. Rantz.
For sale by GPO, Washington, D.C. 20402, Price $0.70. Geological Survey Water-Supply Paper 2009-A, 1972. 38 p, 4 fig, 1 plate, 4 tab, 3 ref.

Descriptors: *Runoff, *California, *Variability, *Rainfall-runoff relationships, Snowmelt, Base flow, Altitude, Snowpacks, Streamflow, Streamflow forecasting, Precipitation (Atmospheric), Water balance, Rainfall.

California streams exhibit a wide range of runoff characteristics related to the climatologic, topographic, and geologic characteristics of the basins they drain. The runoff characteristics are identified by numerical index values. They are related to mean annual precipitation, altitude, latitude, and location. Streamflow is generally ephemeral if the mean annual precipitation is less

than 10 inches, intermittent if the mean annual precipitation is between 10 and 40 inches, and perennial if the mean annual precipitation is more than 40 inches. Latitude and altitude determine the proportion of the winter precipitation that will be stored for subsequent runoff in the late spring and summer. In general, if a watershed has at least 30% of its area above the normal altitude of the snowline on April 1, it will have significant snowmelt runoff. If the sum of the August and September runoff exceeds 3.0% of the annual runoff, base flow is well sustained. If the percentage is less than 1.5, base flow is poorly sustained. The distribution of daily flow is skewed for all streams, but it is more skewed for streams whose flow is predominantly storm runoff than for streams that carry significantly large quantities of snowmelt. Least skewed is the distribution for streams that carry large quantities of base flow. The variability of storm-runoff streams is greater than that of snowmelt streams, and the lowest values of variability are associated with streams that carry large quantities of base flow. (Knapp-USGS)
W73-10447

WATER BALANCE IN SOVIET CENTRAL ASISA (VODNYY BALANS TERRITORII SREDNEY AZII).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02A.
W73-10448

SOME RESULTS AND WAYS OF DEVELOPING METHODS OF STREAMFLOW MEASUREMENT IN MOUNTAIN COUNTRIES (NEKOTORYYE ITOGI I PUTI RAZVITIYA SPOSOBOV RASCHETA STOKA V USLOVIYAKH GORNYKH STRAN),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 07B.
W73-10449

WATER BALANCE AND RUNOFF LOSSES IN THE FERGANA VALLEY AND GOLODNAYA STEPPE (STRUKTURA VODNOGO BALANSA I POTERI RECHNOGO STOKA V FERGANSKOY DOLINE I GOLODNOY STEPI),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02A.
W73-10456

EFFECTS OF URBANIZATION OF SEDIMENTATION AND FLOODFLOWS IN COLMA CREEK BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04C.
W73-10653

FLOODS IN NEW YORK--1969,
Geological Survey, Albany, N.Y.
F. L. Robison.
New York State Department of Environmental Conservation Report of Investigation RI-13, 1973. 33 p, 14 fig, 2 tab.

Descriptors: *Floods, *Flood damage, *Flood peak, *New York, *Flood data, Streamflow, Hydrologic data, Rainfall-runoff relationships, Gaging stations, Flood frequency, Flood flow.
Identifiers: *New York State floods (1969).

Intense rainfall in southeastern New York, July 27-28, 1969, produced high flows on streams in Sullivan and neighboring counties. Precipitation of 3.18 to 9.20 inches was reported. Total damage to streets, highways, homes, and business places in Sullivan County was estimated to exceed $2 million. The county was declared a disaster area. Peak flows on several streams ranged in frequency of occurrence between 40 and 200 years. Very heavy rains in central New York and the southwestern Adirondacks on May 18-20 totaled 3.5 to 6.5 inches. The recorded peak discharge of 11,300 cfs at the Black River at Boonville gaging station on May 20 was the second highest in 58 years of record. Because a large part of the area affected by this storm is rural, most of the damage was done to highways, bridges, and farmland. On June 23 a cloudburst dropped nearly 6 inches of rain on the village of McGraw in Cortland County. Peak discharges for the Smith and Trout Brooks have recurrence intervals greater than 50 years. Total damage in the village was estimated at $500,000. (Woodard-USGS)
W73-10655

RAYLEIGH-RITZ AND GALERKIN FINITE ELEMENTS FOR DIFFUSION-CONVECTION PROBLEMS,
Manchester Univ. (England). Simon Engineering Lab.
For primary bibliographic entry see Field 02F.
W73-10670

THE WATER RESOURCES PROGRAMS OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Washington, D.C.
W. A. Radlinski.
Water Resources Bulletin, Vol 9, No 2, p 366-371, April 1973.

Descriptors: *Water resources, *Research and development, *Data collections, *Investigations, *Federal government, Mapping, Surveys, Water resources development, Water quality, Groundwater, Surface waters, Hydrology, Hydrogeology.
Identifiers: *U.S. Geological Survey.

The water resources programs of the U.S. Geological Survey are unique among Federal agencies; the Survey does not operate or manage water facilities, but provides facts that are used by other organizations. This separation of fact finding from action programs assures information free from bias. USGS operates 18,000 surface water stations. Water levels are measured at 28,000 observation wells. An urban hydrology program provides data such as rainfall, runoff, and water quality for use in the management of storm runoff, land-use planning, housing development, and highway construction. Estuarine and coastal water studies are underway. A flood-hazard mapping program shows areas subject to inundation. Groundwater recharge investigations determine the extent that groundwater storage can be used to supplement storage in surface reservoirs. A subsurface waste-storage program develops information on formations used for waste storage. The Gulf Coast Hydroscience Center greatly increases capability for research and development. The National Water Data Exchange is designed to improve communications between collectors and users. (Knapp-USGS)
W73-10674

STREAM BASEFLOW PREDICTION BY CONVOLUTION OF ANTECEDENT RAINFALL EFFECTS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-10675

EFFECTS OF TIME STEP SIZE IN IMPLICIT DYNAMIC ROUTING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
D. L. Fread.
Water Resources Bulletin, Vol 9, No 2, p 338-351, April 1973. 8 fig, 30 ref.

Descriptors: *Routing, *Finite element analysis, *Unsteady flow, Numerical analysis, Mathematical models, Equations, Open channel flow, Mathematical studies.
Identifiers: *Dynamic routing.

The effects of the size of the time step used in the integration of the implicit difference equations of unsteady open-channel flow were determined for typical hydrographs with durations in the order of days or weeks. Truncation errors related to the size of the time step cause a numerical distortion (dispersion and attenuation) of the computed transient. The magnitude of the distortion is related directly to the size of the time step, the length of channel reach, and the channel resistance, and inversely to the time of rise of the hydrograph. The type of finite difference expression which replaces spatial derivatives and nonderivative terms in the partial differential equations of unsteady flow has an important influence on the magnitude of the numerical distortion, as well as the numerical stability of the implicit difference equations. Time step sizes in the range of 3 to 6 hrs generally tend to minimize the combination of required computation time and numerical distortion of transients having a time of rise of the order of several days. (Knapp-USGS)
W73-10676

AN ON-SITE HYDROLOGIC DATA RECORDING SYSTEM,
Utah Water Research Lab, Logan.
For primary bibliographic entry see Field 07B.
W73-10677

PRECISE WATER VELOCITY MEASUREMENTS USING PHOTOGRAMMETRIC TECHNIQUES,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05B.
W73-10678

HYDROLOGICAL STUDIES OF THE UPPER PARAGUAY RIVER BASIN (PANTANAL REGION, MATO GROSSO STATE, BRAZIL),
United Nations Educational, Scientific and Cultural Organization, New York. Div. of Natural Resources Research.
L. Lisoni, and E. Stretta.
Nature and Resources, Vol 9, No 1, p 10-13, January-March 1973.

Descriptors: Water resources development, *Hydrology, *Flood plains, *South America, Planning, Programs, Data collections, Model studies, Computer models, Flood control, Flood forecasting, Streamflow, River basins, Project purposes.
Identifiers: *Paraguay River basin (Brazil), United Nations Development Program.

Fifteen hundred kilometers west of the Atlantic coast, along the boundary between Brazil, Bolivia, and Paraguay, lies a most unusual region of the South American continent, the Pantanal zone, which consists of a huge flood plain, 50,000 square kilometers with a river basin some 400,000 square kilometers, adjoining that of the Amazon and Parana Rivers. The Paraguay River and its tributaries traverse this region at an altitude between 50 and 140 meters. In some years, streams and lagoons merge in the rainy season to form a huge sheet of water which flows slowly towards Asuncion (Paraguay) and the Rio de la Plata, moving across more than 1,500 kilometers before joining the Parana. The purpose of the project, approved by the United Nations Development Program, is to set up a hydrometeorological network in the Upper Paraguay Basin and to conduct surveys to investigate the hydraulic system of the Pantanal; at the same time environmental studies will be carried out, and an attempt will be made to establish a flood forecasting system based on an experimental model. (Woodard-USGS)

COPY 11 OF 1. URBANA-CHAMPAIGN

W73-10682

PREDICTING DEGREE DAY SNOW MELT FACTORS WITH CROWN CLOSURE IN ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. L. Jackson.
M.S. Thesis, 1972. 51 p, 11 fig, 6 tab, 44 ref. OWRR-A-029-ARIZ (1).

Descriptors: *Forecasting, *Snowmelt, *Canopy, *Ponderosa Pine, *Snow management, *Arizona, Limiting factors, Southwest U.S., Water demand, Water supply, Water harvesting, Model studies, *Regression analysis, Air temperature, Equations, Rainfall-runoff relationships.
Identifiers: *Crown closure.

Water is a major factor limiting man's economic and social development in the arid regions of the Southwest. Increased water demand in Arizona causes evaluation of possibilities for increasing surface runoff from high elevation snow accumulation areas. Snow-melt indices based on air temperatures were evaluated using Arizona ponderosa pine overstory crown closure as an inventory prediction variable by regression analysis. Degree day snowmelt factors were dependent variables and percent crown closure was the independent variable. Median air temperature was non-significant. Maximum air temperature was significant, though it explained only 12 percent of the variation in snowmelt. The regression equation does not appear adequate for snowmelt prediction in field situations. Crown closure did not appear to be an adequate predictor of median or maximum temperature degree day snow melt factors in Arizona ponderosa pine. (Popkin-Arizona)
W73-10697

INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS AND FLOODING, LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
R. L. Cooley, G. W. Fiero, Jr., L. H. Lattman, and A. L. Mindling.
Available from the National Technical Information Service as PB-221 121, $3.00 in paper copy, $0.95 in microfiche. Project Report No. 21, February 1973, 41 p., 33 fig, 2 tab, 17 ref, append. OWRR B-055-NEV (1). 14-31-0001-3613.

Descriptors: *Caliche, *Infiltration, *Flash floods, Urban drainage, *Nevada, Floods, *Flood control, Runoff, Precipitation (Atmospheric), Impoundments.
Identifiers: *Las Vegas (Nev.), *Red Rock Canyon Fan (Nev.).

The study was conducted on the Red Rock Canyon fan which is a large alluvial fan bordering the Las Vegas basin on the east flank of the Spring Mountains. The objectives were (1) to determine the types, degrees of development, and distribution of calcium carbonate deposition on the Red Rock Canyon fan as these affect infiltration and runoff; (2) to investigate the engineering projects designed for flood control in the urban area in relation to the expected runoff; (3) to obtain geomorphic and hydrologic information essential to the selection of alternative sites for artificial recharge and flood impoundments; and (4) to coordinate the study with local agencies currently planning flood control projects. Because adequate precipitation and runoff data were not available and could not be collected during the short term of the project, the study was concentrated upon the potential for the factors studied to influence runoff. (Schulke-Nevada)
W73-10721

SHELF SEDIMENT TRANSPORT: PROCESS AND PATTERN.
For primary bibliographic entry see Field 02J.
W73-10746

AN INTRODUCTION TO OCEANIC WATER MOTIONS AND THEIR RELATION TO SEDIMENT TRANSPORT,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W73-10747

WAVE BOUNDARY LAYERS AND THEIR RELATION TO SEDIMENT TRANSPORT,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W73-10748

EXPERIMENTS ON BOTTOM SEDIMENT MOVEMENT BY BREAKING INTERNAL WAVES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 02J.
W73-10750

SEDIMENT TRANSPORT ON THE CONTINENTAL SHELF OFF OF WASHINGTON AND OREGON IN LIGHT OF RECENT CURRENT MEASUREMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W73-10753

IMPLICATIONS OF SEDIMENT DISPERSAL FROM LONG-TERM, BOTTOM-CURRENT MEASUREMENTS ON THE CONTINENTAL SHELF OF WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W73-10754

SUSPENDED SEDIMENTS IN CONTINENTAL SHELF WATERS OFF CAPE HATTERAS, NORTH CAROLINA,
Illinois Univ., Chicago. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-10758

IMPLICATIONS OF SEDIMENT DISPERSAL FROM BOTTOM CURRENT MEASUREMENTS; SOME SPECIFIC PROBLEMS IN UNDERSTANDING BOTTOM SEDIMENT DISTRIBUTION AND DISPERSAL ON THE CONTINENTAL SHELF--A DISCUSSION OF TWO PAPERS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 02J.
W73-10763

OBSERVATIONS AND SIGNIFICANCE OF DEEP-WATER OSCILLATORY RIPPLE MARKS ON THE OREGON CONTINENTAL SHELF,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W73-10771

A SOLUTION TO SMALL SAMPLE BIAS IN FLOOD ESTIMATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
W. Metler.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 351-368, (1972). 3 ref.

Descriptors: *Flood forecasting, *Sampling, *Algorithms, *Design criteria, Statistical models, Culverts, Bridges, Regression analysis, Equations, History, Stream gages, Average flow, Peak discharge, Regional flood, Regional development, Missouri.

To design culverts and bridges that will pass certain design floods, computations of the estimates of such floods must be specified. Regression analysis is one method of predicting design floods for construction sites. Determination of such predictions depends on the regression coefficients, which in turn depend on estimates of the floods computed from historical records. The computation of the historical estimate that must serve as input to the regression analysis is discussed. Regression predictions based on inputs computed from the number of standard normal deviates from the mean introduce a bias into the estimate, however, because of the small sample size commonly encountered in streamflow estimation. The predictions will, therefore, always be less than regression predictions based on the so-called t-estimate which will provide a more realistic prediction. Equations demonstrate the applicability of this theory. Demonstration sites chosen are in the plains region of Missouri, restricted to those areas of less than 30 sq. miles, where historical records were provided by the USGS. (See also W73-10818) (Paylore-Arizona)
W73-10840

OBJECTIVE AND SUBJECTIVE ANALYSIS OF TRANSITION PROBABILITIES OF MONTHLY FLOW ON AN EPHEMERAL STREAM,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
W. Dvoranchik, L. Duckstein, and C. C. Kisiel.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the American Water Resources Assn., Arizona Section, and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 407-437. 1972. 6 tab, 2 fig, 7 ref.

Descriptors: *Analysis, *Probability, *Monthly, *Ephemeral streams, *Statistical methods, Watershed management, Stochastic processes, Daily hydrographs, Streamflow forecasting, Model studies, Digital computers, Simulation analysis, Regulation, Arizona, Arid lands.

A critique of statistical properties of monthly flows on an ephemeral stream in Arizona is given. A subjective procedure, justified for managerial purposes not concerned with the variability of flow within the month, is proposed for sequential generation of monthly flow data. Ephemeral flows should be modeled by starting with at least historical daily flows for more meaningful monthly flow models. Stochastic properties of monthly streamflows and state transition probabilities are reviewed with regard to ephemeral streams. A flow chart for a streamflow model geared to digital computers, with a simulation of streamflow subroutine, is developed. Meaningful monthly flow models could serve as a check on alternative models (subjective matrix, lag-one auto regressive, harmonic, bivariate normal, bivariate log-normal models). Rules and guidelines are presented in developing meaningful probability matrices. (See also W73-10818) (Popkin-Arizona)
W73-10843

A PROPOSED MODEL FOR FLOOD ROUTING IN ABSTRACTING EPHEMERAL CHANNELS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
L. J. Lane.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section-Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 439-453. (1972). 3 fig, 1 tab, 23 ref.

Descriptors: *Model studies, *Flood routing, *Flood forecasting, *Ephemeral streams, *Rainfall disposition, Rainfall-runoff relationships, Watershed management, Range management, Thunderstorms, Rainfall, Streamflow, Vegetation, Groundwater recharge, Bank storage, Rates, Storage, Arizona.

Almost all runoff from semiarid rangeland watersheds in southern Arizona results from intense highly variable thunderstorm rainfall. Abstractions, or transmission losses, are important in diminishing streamflow, supporting riparian vegetation and providing natural groundwater recharge. A flood routing procedure is developed using data from the Walnut Gulch Experimental Watershed, where flood movement and transmission losses are represented by a system using storage in the channel reach as a state variable which determines loss rates. Abstractions are computed as a cascade of general components in linear form. Wide variation in the parameters of this linear model with increasing inflow indicates that a linear relation between losses and storage is probably incorrect for ephemeral channels. (See also W73-10818) (Popkin-Arizona)
W73-10844

BED MATERIAL CHARACTERISTICS AND TRANSMISSION LOSSES IN AN EPHEMERAL STREAM,
Agricultural Research Service, Tucson. Southwest Watershed Research Center.
J. B. Murphey, L. J. Lane, and M. H. Diskin.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 455-472. (1972). 2 tab, 3 fig, 8 ref.

Descriptors: *Bed load, *Channel morphology, *Ephemeral streams, *Streamflow, *Thunderstorms, Convection, Storms, Limiting factors, Geology, Geomorphology, Volume, Porosity, Specific yield, Alluvium, Absorption, Cross sections, Correlation analysis, Arizona, Arid lands.
Identifiers: Transmission losses.

An average of 6 to 13 streamflows from intense summer convective storms occurs annually in the Walnut Gulch Experimental Station, 58 square miles in southeastern Arizona. Flows last generally less than 6 hours, and the channels are dry 99 percent of the time. The limiting factors imposed by the geology and geomorphology of the channel to transmission losses of a 6 square mile channel in the Station are described. The Precambriam to Quaternary geology is outlined, and geomorpholoyg of the channels are described. Volume, porosity and specific yield of alluvium were determined. There is 106 acre-feet of alluvium with a mean specific yield of 28 percent, and a maximum water absorbing capacity of 29 acre-feet or 7 acre-feet per mile of reach. Channel slope is insensitive to changes in geological material beneath it or to changes in flow regime. Channel cross section is highly sensitive to geology and flow regime. Transmission losses were highly correlated to volume of inflow. (See also W73-10818) (Popkin-Arizona)
W73-10845

WATER DISPOSITION IN EPHEMERAL STREAM CHANNELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
T. W. Sammis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 473-491. (1972). 5 fig, 3 tab, 15 ref.

Descriptors: *Rainfall disposition, *Ephemeral streams, *Groundwater recharge, *Infiltration, *Evapotranspiration, Equations, Forecasting, Vegetation, Channels, Climates, Evaporation, Instrumentation, Infiltrometers, Simulation analysis, Soil structure, Field capacity, Arizona, Arid lands, Riparian plants.
Identifiers: Transmission losses, Philip's equation.

The contribution of flows from small watersheds to groundwater recharge is of interest. Water disposition depends on infiltration and evaporation characteristics. This study had the objective of developing an infiltration equation for estimating transmission losses during a flow event in an ephemeral stream near Tucson, Arizona, in the Rocky Mountain Forest and Range Experiment Station. Palo verde, desert hackberry, cholla, marmontea and mesquite are the major bank species of the sandy channels. A climatic section consisting of a hydrothermograph recording rain gage and class A evaporation pan was installed. A water balance method was used to estimate evapotranspiration. A specially designed infiltrometer was used to simulate flow events. The data allowed the following conclusions: Philip's infiltration equation is an excellent mathematical model, initial moisture affects initial infiltration rate, the Philip coefficients are determinable by the infiltrometer constructed, soil moisture affects infiltration rates, and transpiration rates diminish linearly proportional to the ratio of available water to field capacity. (See also W73-10818) (Popkin-Arizona)
W73-10846

INFORMATION CONTENT OF TIME-VARIANT DATA,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-10969

MAXIMUM BREAKER HEIGHT,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W73-10975

CHARACTERISTICS OF WAVE RECORDS IN THE COASTAL ZONE,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W73-10979

FLOOD PLAIN INFORMATION--MEADOW CREEK, EAGLE RIVER, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W73-10981

RECONNAISSANCE OF THE MANISTEE RIVER, A COLD-WATER RIVER IN THE NORTHWESTERN PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-10985

FREE-SURFACE IDEAL FLUID FLOWS BY FINITE ELEMENTS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-10988

COMPARISON OF BRIDGE BACKWATER RELATIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, J. W. H. Barrett, W. R. Walker, and L. H. Austin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9799, p 921-938, June 1973. 14 fig, 8 ref, append. AID Contract csd-2460.

Descriptors: *Backwater, *Flow profiles, *Equations, *Bridges, Non-uniform flow, Open channel flow, Subcritical flow, Stage-discharge relations.
Identifiers: *Submerged flow.

Flow conditions at a proposed bridge site on an open channel may be either uniform or nonuniform, depending on channel conditions. The effect of the constriction on the water surface profile, both upstream and downstream, is conveniently measured with respect to the normal water surface profile, which is the water surface in the absence of the constriction under the original flow conditions. Irrespective of the original flow conditions existing at the bridge site, by using a combination of the momentum and continuity equations a general submerged flow equation may be obtained for the open-channel constriction. By making two simplifying assumptions and manipulating the remaining variables, this equation may be expressed in the form of a submerged flow equation. The equations may be plotted on the coordinates used for submerged flow analysis, with head loss as the abscissa, discharge as the ordinate, and a series of parallel straight lines of slope 3/2 representing the different values of submergence. (Knapp-USGS)
W73-10990

2F. Groundwater

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 2, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-10445

GEOHYDROLOGIC STUDY OF THE GORT LOWLAND AND ADJACENT AREAS OF WESTERN IRELAND USING ENVIRONMENTAL ISOTOPES,
Ceylon Univ., Peradeniya.
R. Bowen, and P. W. Williams.
Water Resources Research, Vol 9, No 3, p 753-758, June 1973. 3 fig, 2 tab, 9 ref.

Descriptors: *Karst hydrology, *Water circulation, Mixing, Groundwater movement, Karst, Tritium, Tracers, Stable isotopes, Oxygen isotopes, Hydrogeology, Groundwater basins.
Identifiers: *Ireland (Gort Lowland).

Analyses of 0-18 and tritium in precipitation, surface waters, and groundwaters in western Ireland show that the groundwaters fall into a single group isotopically indicative of the good mixing to be expected in a karstic region. Components of modern (post-1954) recharge are present, suggesting relatively rapid circulation in the groundwater system. Some retarding of circulation is a result of 'covered karst' mantling. (Knapp-USGS)
W73-10660

MASS BALANCE AND SPECTRAL ANALYSIS APPLIED TO KARST HYDROLOGIC NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
M. C. Brown.

UNIVERSITY OF ILLINOIS URBANA CHAMPAIGN

Water Resources Research, Vol 9, No 3, p 749-752, June 1973. 4 fig, 8 ref.

Descriptors: *Water balance, *Karst hydrology, *Statistical methods, Variability, Tracers, Hydrologic budget, Caves, Subsurface flow, Fourier analysis, Frequency analysis, Input-output analysis.
Identifiers: Spectral analysis.

Underground karst drainage systems can be studied by the input-output relations of rivers that flow through them. Tracers enable the quantity of water at a sink that flows to a specific spring, and the fraction of a given spring derived from a sink, to be calculated. When tracer methods are not applicable, cross-covariance and cross-spectral transfer function analysis can be used to examine input-output stage records. These give information about the vadose and/or phreatic nature of the system. An inaccessible karst drainage system in western Alberta has a tracer flow-through time of 80 to 130 hours and a positively skewed cross covariance of 70 to 124 hours; therefore the cave is not completely water filled. Additional unknown inputs are substantiated by a negatively peaking cross covariance. (Knapp-USGS)
W73-10661

BEHAVIOR OF GROUNDWATER FLOW SUBJECT TO TIME-VARYING RECHARGE,
Water Resources Engineers, Inc., Springfield, Va.
M. T. Tseng, and R. M. Ragan.
Water Resources Research, Vol 9, No 3, p 734-742, June 1973. 12 fig, 9 ref.

Descriptors: *Groundwater movement, *Recharge, *Equations, *Numerical analysis, Hydraulic models, Water table, Simulation analysis, Mathematical models.
Identifiers: Hele-Shaw models.

The dynamic response of two-dimensional unconfined aquifers subject to localized recharge was studied theoretically. The variations of free surface profiles, discharges, and the flow patterns with respect to time in both fully penetrated and partially penetrated aquifer systems are obtained by solving the governing partial differential equations numerically. The method treats the nonlinear free surface boundary as an initial condition, and the overall flow region is solved as a boundary value problem. The numerical results agree with experimental data obtained from Hele-Shaw models. The method may be applied to study the quantitative and qualitative changes in groundwater reservoirs resulting from artificial or natural recharge. (Knapp-USGS)
W73-10662

MATHEMATICAL SIMULATION OF THE SUBSIDENCE OF VENICE: 1. THEORY,
Centro di Ricera IBM di Venezia (Italy).
G. Gambolati, and R. A. Freeze.
Water Resources Research, Vol 9, No 3, p 721-733, June 1973. 3 fig, 30 ref.

Descriptors: *Land subsidence, *Withdrawal, *Mathematical models, Subsidence, Consolidation, Hydrogeology, Compaction, Water levels, Drawdown, Soil mechanics, Mathematical studies, Finite element analysis, Numerical analysis.
Identifiers: *Venice (Italy).

Land subsidence theory was used to construct a mathematical model to simulate the subsidence at Venice. The model can be used to link realistically the occurrence of land subsidence to the groundwater withdrawals that are its cause. Approaches based on the independent solution of the diffusion equation are practical as long as the conditions underlying the development of the equation are recognized, and, if necessary, monitored. A two-step procedure is used to analyze the subsidence in the complex aquifer-aquitard system. First, the regional hydraulic head drawdowns are calculated in a two-dimensional vertical cross section in radial coordinates using an idealized 10-layer representation of the geology. The computation are carried out with a model based on the diffusion equation and solved with a numerical finite element technique. The calculated head values in the aquifers are then used as time dependent boundary conditions in a set of one-dimensional vertical consolidation models solved with a finite difference technique and applied to a more refined representation of each aquitard. (Knapp-USGS)
W73-10663

SIMULATION OF HYDROCHEMICAL PATTERNS IN REGIONAL GROUNDWATER FLOW,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W73-10664

GEOMORPHOLOGY AND HYDROLOGY OF KARST DRAINAGE BASINS AND CAVE CHANNEL NETWORKS IN EAST CENTRAL NEW YORK,
Texas Univ., Austin. Dept. of Geological Sciences.
V. R. Baker.
Water Resource Research, Vol 9, No 3, p 695-706, June 1973. 13 fig, 1 tab, 39 ref.

Descriptors: *Karst hydrology, *New York, *Karst, *Geomorphology, Hortons law, Caves, Meanders, Carbonate rocks, Subsurface drainage, Sinks, Springs, Terrain analysis, Hydrogeology, Groundwater movement, Tracers, Dye releases.

Surface water in the karst drainage basins of east central New York is collected by swallow holes on upland surfaces. Free surface streams, flowing through meandering cave conduits, provide links between the upland surface catchments and large karst springs draining into the major river valleys. Flow through the conduits fluctuates markedly with surface runoff. Mean velocities of 0.5 ft/sec were determined during a period of rapid snowmelt by dye tests. The cave conduits form an integral part of a drainage organization characterized by Horton's hierarchy stream numbers, lengths, and drainage areas. The conduits, the highest-order streams in the hierarchy, have meandering reaches with wavelengths directly related to upstream drainage area and contributed runoff. Both the morphology of the cave channels and the hydrology of the karst drainage basins are strikingly similar to those observed in surface water stream systems. (Knapp-USGS)
W73-10665

FATE OF SUSPENDED SEDIMENT DURING BASIN RECHARGE,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 02J.
W73-10668

RAYLEIGH-RITZ AND GALERKIN FINITE ELEMENTS FOR DIFFUSION-CONVECTION PROBLEMS,
Manchester Univ. (England). Simon Engineering Lab.
I. M. Smith, R. V. Farraday, and B. A. O'Connor.
Water Resources Research, Vol 9, No 3, p 593-606, June 1973. 16 fig, 26 ref.

Descriptors: *Finite element analysis, *Diffusion, *Convection, Numerical analysis, Groundwater movement, Mixing, Mathematical studies, Mathematical models, Porous media, Heat transfer.
Identifiers: Galerkins method.

Finite element methods are presented for the solution of two-dimensional partial differential equations of interest in water resource problems. Galerkin's method for one-dimensional problems is shown to be a prototype finite element technique. Previous variational (Rayleigh-Ritz) formulations of finite elements for some problems are misleading and are of limited application when compared with Galerkin's method. The accuracy and stability of the techniques presented are discussed in relation to the numerical diffusion and dispersion phenomena prevalent in finite difference methods. (Knapp-USGS)
W73-10670

HYDROLOGIC STUDIES USING THE BOUSSINESQ EQUATION WITH A RECHARGE TERM,
Stanford Univ., Calif. Dept. of Applied Earth Sciences.
M. B. Zucker, I. Remson, J. Ebert, and E. Aguado.
Water Resources Research, Vol 9, No 3, p 586-592, June 1973. 8 fig, 19 ref. NSF Grant GK-26153X1.

Descriptors: *Groundwater movement, *Equations, *Mathematical models, *Water balance, *Recharge, Hydrogeology, Dupuit-Forchheimer theory, Drawdown, Water yield.
Identifiers: *Boussinesq equation.

The Boussinesq equation, which describes one-dimensional unconfined groundwater movement, was modified to accept groundwater recharge as computed by a climatological soil-moisture balance. It may be solved by using a predictor-corrector technique for nonlinear partial differential equations. The method is useful in studies of the effects of system parameters on groundwater and in the determination of system parameters by the inverse method. The effects of land development on groundwater yield and on groundwater discharge to streams are predicted. (Knapp-USGS)
W73-10671

THE WATER RESOURCES PROGRAMS OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W73-10674

ELECTROMAGNETIC DEPTH SOUNDING EXPERIMENT ACROSS SANTA CLARA VALLEY,
California Univ., Berkeley. Dept. of Geoscience Engineering.
For primary bibliographic entry see Field 04B.
W73-10720

ROLE OF CONNECTICUT RIVER FLOOD FLOWS IN RECHARGING GROUND-WATER FORMATIONS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 04B.
W73-10733

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-10744

HYDROGEOLOGY AND ENGINEERING GEOLOGY (GIDROGEOLOGIYA I INZHENERNAYA GEOLOGIYA).

Mezhdunarodnyy Geologicheskiy Kongress, XXIV Sessiya, Sektsii No 11 and 13, Simpozium No 1; Izdatel'stvo 'Nauka', Moscow, 1972. 167 p.

Descriptors: *Hydrogeology, *Engineering geology, *Groundwater, Groundwater movement, Climates, Pressure, Temperature, Permafrost,

Rocks, Rock properties, Structural geology, Water quality, Water chemistry, Geochemistry, Biochemistry, Paleohydrology, Geophysics, Seismic studies, Forecasting, On-site investigations, Conferences.
Identifiers: USSR, Hydrosphere, Taliks.

This collection contains papers prepared by the National Committee of USSR Geologists for presentation at the 24th Session of the International Geological Congress held in Montreal, Canada in August 1972. Various aspects of groundwater development are examined, including the role of climate, pressure, temperature, permafrost, and hydrogeological processes in the formation of the quality characteristics of groundwater. Papers concerned with the application of the geological sciences to engineering practice deal with the physical characteristics of rocks, on-site investigations of rock properties, present geodynamic and geologic-engineering processes, and the role of geology in physiographic conditions altered by man. (Josefson-USGS)
W73-10777

A CONTRIBUTION TO THE KNOWLEDGE OF PHYSICAL AND CHEMICAL PROPERTIES OF THE GROUND WATERS IN THE SLOVENE KARST,
Yugoslav Academy of Sciences and Arts, Zagreb.
D. Novak.
Krs Jugosl Carsus Iugosl. Vol 7, No 5, p 171-188. 1971. Illus. In Czech. also.
Identifiers: Chemical properties, *Groundwater, Physical properties, *Slovene Karst, Temperature, *Yugoslavia, Hydrogen ion concentration.

During the period 1963 to 1966 observations of 10 resurgences in the Slovenian karst region were made. Water level, air and water temperature, total and carbonate hardness, pH and Cl contents were measured. The results were compared with changes in air temperature and quantity of precipitation. The necessity of intensive studies of the influence of precipitation on karst groundwaters is evident. Diagrams show the values of carbonate hardness, temperature of water and Cl content.--Copyright 1973, Biological Abstracts, Inc.
W73-10801

THE GROUNDWATER SUPPLY OF LITTLE CHINO VALLEY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
W. G. Matlick, and P. R. Davis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 67-85, (1972). 8 fig, 2 tab, 1 ref.

Descriptors: *Groundwater resources, *Groundwater mining, *Withdrawal, *Groundwater recharge, *Water table, Irrigation, Water table aquifers, Artesian aquifers, Water quality, Water utilization, Leakage, Water balance, Water levels, Hydrologic data, Arizona.
Identifiers: Little Chino Valley (Arizona).

The Little Chino Valley in central Arizona presents an interesting groundwater study as withdrawals exceed recharge. The groundwater surface is falling at about 2 feet per year over most of the area due to large irrigation development. A shallow water table aquifer overlies the artesian aquifer and receives recharge from irrigation runoff. Water quality in the artesian aquifer is excellent. Water quality in the water-table aquifer is poorer, being somewhat higher in total salts, but is suitable for most domestic and agricultural uses. Specific yield for the supply area to the artesian aquifer is 12 percent, with estimated annual recharge of 4000 acre feet and leakage from the aquifer of 2300 acre feet. Water budget and use for the basin is presented with water level and water quality data. The multiphase aquifer system is described and illustrated. (See also W73-10818) (Popkin-Arizona)
W73-10824

SUBSIDENCE DAMAGE IN SOUTHERN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. A. McCauley, and R. L. Gum.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 87-94, (1972). 8 ref.

Descriptors: *Subsidence, *Damages, *Groundwater mining, *Aquifers, *Cost analysis, Economic impact, Water table, Compressive strength, Levees, Ditches, Water wells, Structures, Inspection, Hydrologic data, Arizona.

Land is subsiding over a heavily mined aquifer in south central Arizona. Subsidence damages are inventoried to help provide a basis upon which cost studies can be performed to determine actions to lessen the economic impact of these damages. Water table drawdown produces increasing loading stress by three ways: changes in bouyant support of aquifer grains, changes in water table, or both. Two types of subsidence are recognized--one-directional compression, and near surface phenomenon. Damages due to natural structures, and to man-made structures are reviewed. Agricultural damages include field releveling, ditch repair and well damage. Damages to transportational facilities include highways, bridges, pipelines, and railroads. Damages to domestic and urban structures are suggested. Questionnaires, interviews and on-site inspections were used to collect information on land subsidence damages in the study area. (See also W73-10818) (Popkin-Arizona)
W73-10825

TRANSMISSIVITY DISTRIBUTION IN THE TUCSON BASIN AQUIFER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. J. Supkow.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 113-123, (1972). 1 tab, 3 fig, 3 ref.

Descriptors: *Transmissivity, *Frequency distribution, *Hydrologic properties, *Aquifers, *Groundwater basins, Hydrologic data, Hydrologic systems, Model studies, Drainage patterns (Geologic), Alluvial aquifers, Aquifer testing, Water wells, Digital computers, Analog computers, Arizona, Arid lands.
Identifiers: Tucson Basin (Arizona), Horton's Law.

The distribution of transmissivity within the Tucson Basin aquifer, as determined by pumping tests and reviewed in the construction of a digital model of the aquifer, was not totally random in space. Data tended to be distributed normally or log-normally for biased samples of developed wells. A frequency distribution of transmissivity derived from a calibrated digital model is more nearly representative of the real world because the aquifer sample is without bias as the sample constitutes the entire aquifer. Geohydrologic setting, electric analog, and digital models of the basin are discussed. The theory of transmissivity distribution in an arid land alluvial aquifer is developed from Horton's laws of exponential relationship between stream order and drainage network parameters. It is hypothesized that there is an exponential relationship between transmissivity of an alluvial aquifer. A statistical study was made of values derived from the digital model to test the probability density function hypothesized for transmissivity. The mean value is a function of climate and drainage area. These hypotheses require further validation. (See also W73-10818) (Popkin-Arizona)
W73-10827

ELECTROMAGNETIC FIELDS ABOUT A LOOP SOURCE OF CURRENT,
California Univ., Berkeley. Dept. of Geoscience Engineering.
J. Ryu, H. F. Morrison, and S. H. Ward.
Geophysics Vol 35, No 5, p 862-896, October 1970. 31 fig. OWRR B-067-CAL (2). 14-31-0001-1878.

Descriptors: *Electromagnetic waves, Measurement, *Exploration, Geophysics, Groundwater.

Integral expressions for the electromagnetic field components produced by a horizontal loop, carrying a current Ie and placed on or above the surface of an n-layered half-space, are deduced in a form such that numerical integration can be performed easily. The expressions are free of approximations and completely general for all frequencies. They are constrained only to the uniformity of current around the transmitting loop. The resulting computed electromagnetic fields are valid for arbitrary values of the electrical parameters sigma, mu, and epsilon. The quasi-static approximation for the region above the half-space, wherein the wave equation is replaced by the Laplace equation, can be avoided. Measurements outside the loop constitute induction depth sounding. Induction depth sounding curves of field components and magnetic polarization parameters show good resolution of subsurface layering. The measurements of tilt angle and/or ellipticity of the magnetic polarization ellipse should be made to determine earth layering because of the rapidity and ease of these measurements in field operation. The radius of the loop should, in the general case, be taken into account in theoretical computations. Measurements at the center of the loop constitute central induction sounding. Central induction sounding responses are diagnostic only for layered earth models in which conductivity increases with depth. Measurement of the quadrature part of the vertical magnetic field is particularly promising. Theoretical curves for earth models consisting of one layer overlying a half-space are given for the quasi-static case for induction depth sounding, and for the nonquasi-static (general) case for central induction sounding. The response from a homogeneous, conductive, magnetic half-space with the central induction method at low frequencies reveals the feasibility of in-situ determination of static magnetic permeability. The effect of ground conductivity should be included in making the normal correction to Turam data whenever the apparent conductivity of the ground is greater than (1/1000) mhos/m.
W73-10885

AN INVESTIGATION OF THE SESMIC WAVE PROPAGATION PROPERTIES OF A THIN UNSATURATED LAYER AS A WAVE GUIDE,
Michigan State Univ., East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 04B.
W73-10888

NONLINEAR EQUATION OF UNSTEADY GROUNDWATER FLOW,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
J. C. Bruch, Jr.

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Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9589, p 395-403, March 1973. 5 fig, 7 ref, append. OWRR A-039-CAL (Z) WRC Proj W-336.

Descriptors: *Groundwater movement, *Finite element analysis, *Unsteady flow, Water table, Surface-groundwater relationships, Numerical analysis.

Unsteady groundwater movement may be described using a finite element weighted residual process to solve nonlinear partial differential equations. The groundwater in an unconfined aquifer may flow either into or out of a surface reservoir. Rectangular, as well as triangular, finite elements were used in a space-time solution domain. The weighting function was equal to the shape function defining the dependent variable approximation. The results were compared in dimensionless graphs with experimental as well as other numerical data. The finite element method compared favorably with these results and was easily programmed, stable, computationally fast, rapidly convergent, and does not require constant parameters over the entire solution domain. (Knapp-USGS)
W73-10965

UNSTEADY FLOW TWOARD AN ARTESIAN WELL,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W73-10967

EFFECT OF A WATER TABLE AQUITARD ON DRAWDOWN IN AN UNDERLYING PUMPED AQUIFER,
Nevada Univ., at Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04B.
W73-10968

FRICTION FACTOR AND REYNOLDS NUMBER IN POROUS MEDIA FLOW,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
A. Arbhabhirama, and A. A. Dinoy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9784, p 901-911, June 1973. 6 fig, 2 tab, 10 ref, append.

Descriptors: *Porous media, *Fluid friction, *Reynolds number, *Groundwater movement, *Hydraulic radius, Pores, Porosity, Fluid mechanics, Permeability, Hydraulic conductivity.

The concept of hydraulic radius of pore spaces is used to show that the square root of the permeability is the important length parameter in defining the friction factor and Reynolds number in flow through porous media. Hydraulic radius is defined by the Kozeny-Carman theory of hydraulic radius of pore space. Various porous media had different relationships between friction factor and Reynolds number. Experimental results showed a similarity to the Moody diagram used for pipe flow, with the ratio of particle mean diameter to the mean hydraulic radius of pore spaces as the third parameter. (Knapp-USGS)
W73-10991

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN NORTHERN ILLINOIS, 1966--1971,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04B.
W73-10993

FORMATION OF CAVITY IN CONFINED AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W73-10996

2G. Water in Soils

MICROBIAL CHANGES AND POSSIBLE GROUND WATER POLLUTION FROM POULTRY MANURE AND BEEF CATTLE FEEDLOTS IN GEORGIA,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-10403

INVESTIGATION OF NATURAL SEALING EFFECTS IN IRRIGATION CANALS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-10404

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst. Karnal (India).
A. K. Bandyopadhya.
Journal of the Indian Society of Soil Science, Vol 20, No 4, p 407-408, December 1972. 1 tab.

Descriptors: *Water level fluctuations, *Salinity, *Saline soils, *Water chemistry, *Leaching, Evapotranspiration, Salts, Water quality.
Identifiers: *India.

The effect of depth and quality of groundwater on salinization of surface soil was studied in an area with fluctuating water table and water salinity. The water table fluctuated within 107 to 300 cm below the surface soil. Salinity of the groundwater was highest when the groundwater table was furthest from the soil surface. Salinity of the surface soil was also very high during this period. The water table started rising after the onset of monsoon. Recession of water table sets in after the cessation of rainfall. Salinity of the groundwater is diluted with rainwater as the water table came nearer to the surface of the soil. At the same time rainwater also releaches the salts from the soil, thereby reducing the salinity of the surface soil. Increased evaporation from the soil surface during the summer months depresses the water table and increases the concentration of salinity of the groundwater. (Knapp-USGS)
W73-10441

SOME PROBLEMS IN THE WATER REGIMEN OF WEAKLY LEACHED CINNAMON-BROWN SOILS IN THE PARKENTSAY RIVER BASIN (NEKOTORYYE VOPROSY VODNOGO REZHIMA KORICHNEVYKH SLABOVYSHCHELOCHENNYKH POCHV BASSEYNA R. PARKENTSAY),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. Ye. Chub.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 91-96, Leningrad, 1972. 1 fig, 7 tab, 6 ref.

Descriptors: *Regimen, *Soil moisture, *Brown soils, Soil profiles, Soil horizons, Soil properties, Particle size, Air temperature, Precipitation (Atmospheric), Field capacity, Nuclear moisture meters, Variability.
Identifiers: USSR, *Parkentsay River basin, Hygroscopicity.

Neutron-meter measurements were made of the water regimen of weakly leached Cinnomon-Brown soils in the Parkentsay River basin in April-July, 1965-70. Air temperature and precipitation data for the periods of observation are given together with the hydrophysical properties and particle-size distribution of the soils. Soil moisture in the upper 5-cm layer is subject to maximum variations in time, while soil moisture in the 200-cm layer has the least variability. Maximum soil moisture was observed immediately after melting of the snow when it exceeded minimum field capacity, and minimum soil moisture was observed at the end of summer when it was less than maximum hygroscopicity. (See also W73-10448) (Josefson-USGS)
W73-10457

PERSISTENCE OF PARATHION IN SIX CALIFORNIA SOILS UNDER LABORATORY CONDITIONS,
California University, Riverside, Citrus Research Center and Agricultural Experiment Station.
For primary bibliographic entry see Field 05B.
W73-10476

DIRECT TITRIMETRIC MICRODETERMINATION OF FLUORODIFEN, LINURON, FANERON, AND PEBULATE,
Allahabad Agricultural Inst. (India). Dept. of Agronomy.
For primary bibliographic entry see Field 05A.
W73-10481

THE INTERFLOW PROCESS ON SLOPING WATERSHED AREAS,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
T. V. Wilson, and J. T. Ligon.
Available from the National Technical Information Service as PB-221 023, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute, Report No 38, March, 1973. 58 p, 16 fig, 5 tab, append. OWRR B-008-SC (6).

Descriptors: Runoff, *Soil moisture, *Subsurface runoff, Percolation, Soil profiles, Infiltration, Movement, *South Carolina, Watersheds (Basins).
Identifiers: *Piedmont (South Carolina).

The objectives were (1) to determine principal soil factors and conditions influencing the interflow process and (2) to develop relationships leading to quantitative predictions of interflow rates and volumes based on measurable soil characteristics. A field experiment was conducted which included measurements of precipitation, surface runoff, interflow runoff, and soil moisture content on a vegetated plot. Soil moisture tension was also measured at six depths during periods of wet-soil conditions. Interflow was observed twelve times during an eighteen month period. During each event, the topsoil was at or near saturation, indicating that interflow is primarily a saturated-flow phenomenon. The B2T soil layer with a permeability one-seventh that of the topsoil restricted vertical seepage, creating a free-water condition in the topsoil during periods of excessive precipitation. A soil moisture balance procedure was used to account for water in the topsoil, and could serve as a prediction tool for interflow on the plot. Extension of prediction to other watershed areas is doubtful because of the heterogeneity of soils. The potential for increasing groundwater recharge exists by mechanically or biologically increasing the hydraulic conductivity of the restricting layer thereby diverting surface and interflow runoff to downward seepage through the profile.
W73-10563

INITIAL WETTING LOSSES INCURRED BY GROUND LEVEL STEREO GAGES,
Eidgenoessische Technische Hochschule, Zurich, (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
B. Sevruk.
Water Resources Research, Vol 9, No 3, p 759-763, June 1973. 3 fig, 2 tab, 19 ref.

Descriptors: *Rain gages, *Calibrations, *Wetting, Instrumentation, Gaging stations, Rainfall, Rainfall disposition, Water loss, Evaporation.
Identifiers: *Wetting loss (Rain gages).

The wetting losses of the rain catch of 32 galvanized ground-level storage gages with stereo orifices were investigated for the period June through September to determine a correction for the monthly rainfall totals in the basin of Montreux, Switzerland. The wetting of the gage per event as measured in the laboratory as well as in natural conditions ranged from 0.135 mm for the gage with a 15 deg inclined orifice to 0.205 mm for the gage with a 47 deg inclined orifice. The mean wetting correction of rain catch for 32 gages over a 10-year period for June through September amounted to 0.172 mm per event, or to 2.6% of precipitation catch. This percent varied only slightly in the respective years. (Knapp-USGS)
W73-10659

MOISTURE VARIATION AT THE SOIL SURFACE AND THE ADVANCE OF THE WETTING FRONT DURING INFILTRATION AT CONSTANT FLUX,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
C. Braester.
Water Resources Research, Vol 9, No 3, p 687-694, June 1973. 4 fig, 2 tab, 16 ref. USDA Grant FG-1s-287.

Descriptors: *Infiltration, *Soil water movement, *Numerical analysis, *Equations, Finite element analysis, Unsaturated flow, Hydraulic conductivity, Saturated flow, Diffusivity, Wetting.

The problem of infiltration at constant flux at the soil surface was solved approximately in an analytical closed form. The solutions are valuable when dealing with sprinkler irrigation or infiltration of rain. Infiltration into a semi-infinite soil column and infiltration into a soil column of finite length with a constant water table were considered. Analytical and numerical results were compared. The analytical solutions provide a satisfactory prediction of the moisture content at the soil surface and of the advance of the wetting front. The results are presented in a dimensionless form. (Knapp-USGS)
W73-10666

ACCUMULATION OF FALLOUT CESIUM 137 IN SOILS AND SEDIMENTS IN SELECTED WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05B.
W73-10667

WATER INFILTRATION UNDER CENTER--PIVOTS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-10698

THE EFFECT OF ROOT GEOMETRY ON THE YIELD OF WHEAT GROWING ON STORED WATER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research and Regional Survey.
For primary bibliographic entry see Field 03F.
W73-10701

UNDERGROUND CORROSION AND SALT INFILTRATION,
Connecticut Univ., Storrs, Dept. of Civil Engineering.
For primary bibliographic entry see Field 04C.
W73-10712

INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS AND FLOODING, LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 02E.
W73-10721

FILTERS WITH A CONSTANT MOISTURE POTENTIAL AT THE SURFACE (FIL'TRY S POSTOYANNYM POTENTSIALOM VLAGI NA POVERKHNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Torfyanoi Promyshlennosti, Leningrad (USSR).
I. I. Mogilevskiy, and T. P. Cheburkova.
Pochvovedeniye, No 5, p 132-133, May 1972. 1 fig, 7 ref.

Descriptors: *Filters, *Surfaces, Sands, Peat, Particle size, Measurement.
Identifiers: *USSR, *Moisture potential.

A device is proposed for maintaining a given moisture potential at the surface of a filter. The working surface of the filter is several times larger than that of a Schott filter, and the large working volume can be used to measure the moisture potential directly at the surface of the filter as well as at different points on a soil sample. (Josefson-USGS)
W73-10774

MOVEMENT OF WATER VAPOR IN SOIL UNDER ISOTHERMAL CONDITIONS (DVIZHENIYE PAROV VODY V POCHVE V IZOTERMICHESKIKH USLOVIYAKH),
D. N. Onchukov, V. P. Ostapchik, and V. G. Charnyy.
Pochvovedeniye, No 5, p 79-85, May 1972. 5 fig, 10 ref.

Descriptors: *Soil physics, *Soil water movement, *Water vapor, *Isotherms, Temperature, Humidity, Moisture content, Vapor pressure, Soil physical properties, Particle size, Instrumentation, Equations.
Identifiers: USSR, Vapor density.

Isothermal movement of water vapor in soil was investigated in a sample of coarse clay taken from the upper (0-10 cm) layer of soil on a test plot of the Kalinin kolkhoz, Krasnogvardeyskoye Rayon, Crimean Oblast. Vapor sorption by the soil and vapor migration toward the soil surface are analyzed, and formulas are derived for calculating the vapor flux density as a function of either the relative humidity of the air above the soil or of the soil moisture gradient. For average soil moisture gradients observed in surface layers of nonirrigated Crimean soils, the vapor flux density under isothermal conditions is 8.28 X 0.001 kg/sq m/hr. A number of important physical characteristics of the soil are computed, including particle-size distribution, the sorption isotherm, and the dependence of the coefficients of vapor conductivity and molecular vapor flow on the soil moisture content. (Josefson-USGS)
W73-10775

WATER REGIME OF SOD-BROWN SOILS AND RELATION OF TEA-LEAF YIELD TO PRECIPITATION (VODNYY REZHIM DERNOVO-BUROZEMNYKH POCHV I ZAVISIMOST' UROZHAYA CHAYNOGO LISTA OT OSADKOV),
P. M. Bushin.
Pochvovedeniye, No 5, p 68-78, May 1972. 3 fig, 5 tab, 21 ref.

Descriptors: *Soil physics, *Soil-water-plant relationships, *Soil moisture, *Precipitation (Atmospheric), *Brown soils, Soil properties, Plant growth, Crop production, Irrigation practices, Correlation analysis, Regression analysis, Forecasting.
Identifiers: USSR, *Tea plants.

The water regime of Sod-Brown soils and the growth and production of tea on them were investigated in 1966-69 at the Adler tea farm in Krasnodar Territory. Quantitative relations are established between precipitation and the capacity of a tea shrub to form shoots during individual growing periods. The possibility of preparing a short-term forecast of tea-leaf harvest time and of applying different methods of irrigation to tea plantings is discussed and justified. (Josefson-USGS)
W73-10776

DETERMINATION OF EVAPORATION OF WATER FROM ARID LOESS SOILS DURING NIGHTLY TEMPERATURE INVERSION PHASE BY TRITIUM-LABELING OF PREDETERMINED SOIL LAYERS,
For primary bibliographic entry see Field 02D.
W73-10802

SIGNIFICANCE OF ANTECEDENT SOIL MOISTURE TO A SEMIARID WATERSHED RAINFALL RUNOFF RELATION,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
D. L. Chery, Jr.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 385-406, (1972). 3 tab, 11 fig, 10 ref.

Descriptors: *Antecedent moisture content, *Soil moisture, *Rainfall-runoff relationships, *Streamflow, Arid lands, Peak discharge, Runoff, Hydrologic data, Watersheds (Basins), Statistical methods, New Mexico, Southwest U.S.

Numerous reports from the Southwest claim that soil moisture prior to rainfall-runoff event has no influence on the resulting flow volumes and peak rates. Runoff occurs from many storms that would not be expected to produce runoff, and an explanation lies in the occurrence of antecedent rains. This hypothesis is tested by dividing runoff events into 2 subsets--one with no rain within the preceding 120 hours, and the other with some rain within the preceding 24 hours--and to test the null hypothesis. The hypothesis was tested with rainfall and runoff data from a 40-acre Agricultural Research Service watershed west of Albuquerque, New Mexico, using the Wilcoxon's rank sum test. Various levels of statistical significance are discussed, and shown graphically, to conclude conclusively that antecedent rainfall influences runoff from a semiarid watershed. (See also W73-10818) (Popkin-Arizona)
W73-10841

WATER DISPOSITION IN EPHEMERAL STREAM CHANNELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02E.
W73-10846

UNIVERSITY OF ILLINOIS URBANA CHAMPAIGN

SEASONAL DYNAMICS OF CLAYING MEADOW SOIL OF THE ALAZAN VALLEY, (IN AZERBAIJANI),
V. G. Gasanov.
Dokl Akad Nauk Az SSR. Vol 27, No 8, p 65-68, 1971. English summary.
Identifiers: *Alazan Valley, *Clays, Meadow, Seasonal, *Soil moisture.

Spring is characterized by abundant soil moisture and intensive clay development. Fe mobility is high. Clay development slows down in summer as sub-soil water decreases.--Copyright 1973, Biological Abstracts, Inc.
W73-10940

WATER VAPOR ADSORPTION BY WATER--REPELLENT SOILS AT EQUILIBRIUM,
California Univ., Riverside.
S. Miyamoto, J. Letey, and J. Osborn.
Soil Science, Vol 114, No 3, p 180-184, September 1972. 4 fig, 1 tab, 14 ref. OWRR B-072-CAL (9).

Descriptors: *Adsorption, *Water vapor, *Wettability, *Soil moisture, Moisture tension, Soil physical properties, Porous media, Surface tension, Wetting.
Identifiers: *Water-repellent soils.

Water vapor adsorption isotherms were measured in a variety of porous materials which differ in water repellency. These data were then used to calculate the heat of adsorption, integral free energy of adsorption, and check the applicability of Adamson's method in porous media. No specific trend or differences which could be uniquely related to water repellency were found on the amount adsorbed per unit area, the shape of adsorption isotherm, the heat of adsorption and the integral free energy of adsorption. The differences in initial vapor adsorption levels under the controlled temperature did not influence the value of the surface tension. The apparent independence of water vapor adsorption on the differences in surface tension of porous media implied that mechanisms of wettability and repellency of porous media may operate at the portion which is beyond vapor adsorption or masked by other soil properties. (Knapp-USGS)
W73-10966

PRELIMINARY OBSERVATIONS ON DOWNSLOPE MOVEMENT OF SOIL DURING THE FALL IN THE CHINOOK BELT OF ALBERTA,
For primary bibliographic entry see Field 02J.
W73-10977

IRRIGABILITY CLASSIFICATION OF SOILS, (IRRIGABLE SOILS OF NEVADA).
For primary bibliographic entry see Field 03F.
W73-10983

AN ANALYSIS OF STREAM TEMPERATURES IN LOUISIANA,
Geological Survey, Baton Rouge, La.
A. J. Calandro.
Louisiana Department of Public Works Technical Report No 6, 1973. 16 p, 4 fig, 3 tab, 9 ref.

Descriptors: *Water temperature, *Streams, *Louisiana, Basic data collections, Aquatic environment, Environmental effects, *Solar radiation, Air temperature, Seasonal, Diurnal, Monthly, Depth, Deep water, Physical properties, Thermal properties, Variability, Correlation analysis.
Identifiers: Shade.

In Louisiana air temperatures during the summer months are approximately the same throughout the State; water temperatures of streams, however, become progressively cooler from the north to south. During the winter months air temperatures are cooler in the northern part of the State than in the central or southern parts, and water temperatures are about 5 deg F (3 deg C) cooler. A method of analysis developed by M. R. Collings was used to obtain midmonthly temperatures from miscellaneous water-temperature data from 71 sites. When compared to long-term daily temperature stations, the method works very well for Louisiana streams. Monthly temperature duration, average monthly temperatures, and monthly extremes are shown for nine stations throughout the State. These stations are located on the larger streams and rivers. The major natural factors affecting stream temperatures in Louisiana are solar radiation, shade, air temperature, and stream depth. The most important of these is solar radiation. (Woodard-USGS)
W73-10987

UPLIFT PRESSURE BELOW HORIZONTAL APRON WITH CUTOFF AT INTERMEDIATE POINTS, FOUNDED ON ANISOTROPIC PERVIOUS MEDIUM OF FINITE DEPTH,
Jodphur Univ. (India).
For primary bibliographic entry see Field 08B.
W73-10995

2H. Lakes

A FINITE ELEMENT SOLUTION FOR TWO--DIMENSIONAL DENSITY STRATIFIED FLOW,
Water Resources Engineers, Inc., Walnut Creek, Calif.
I. P. King, W. R. Norton, and G. T. Orlob.
Available from the National Technical Information Service as PB-220 967, $3.00 in paper copy, $0.95 in microfiche. Final report, March 1973. 80 p, 16 fig, 3 tab, 32 ref. OWRR C-2052 (3670) (1).

Descriptors: Fluid mechanics, Flow, *Density stratification, Computer models, *Computer programs, *Stokes law, *Diffusion, *Advection, Turbulent flow, Weirs, Unsteady flow, Viscosity, Lakes, Water properties, *Stratified flow.
Identifiers: *Finite Element Method, *Two-dimensional flow, Turbulent exchange coefficient, Nonlinear equations.

A finite element formulation is presented for solution of problems of two-dimensional flow (vertical elevation). The equations describing the phenomena are assumed to be the two-dimensional version of the Navier Stokes Equations coupled to the advection-diffusion equation for variations in density. In these nonlinear equations the conventional coefficient of viscosity is replaced by a turbulent exchange coefficient when flow is in the turbulent range. The Galerkin method of weighted residuals is described for the finite element method and the use of the Newton-Raphson iterative scheme is explained with respect to incorporation of nonlinear terms in the solution procedure. The result of this derivation is a set of nonlinear simultaneous equations, and implications and programming considerations are discussed. Examples of both constant density (homogeneous) flow and density stratified flow over a submerged weir are included. These examples are compared to experimental results and their accuracy assessed.
W73-10418

WATER RESOURCES OF MOUNTAIN LAKES IN SOVIET CENTRAL ASIA (VODNYYE RESURSY GORNYKH OZER SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. N. Reyzvikh, A. M. Nikitin, and N. M. Abramenkov.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 17-29, Leningrad, 1972. 1 fig, 7 tab, 7 ref.

Descriptors: *Water resources, *Lakes, *Lake morphology, *Lake morphometry, *Mountains, Elevation, Volume, Areal, Water balance, Water types, Water quality, Water chemistry.
Identifiers: USSR, *Soviet Central Asia, Lake classification, Mineralization.

There are 7,172 lakes in Soviet Central Asia and the total water surface area is 10,250 sq km. Of the estimated 50.38 billion cu m of water in the lakes (determined to within plus or minus 5%-10% of true values), 20.3 billion cu m is freshwater, 26 billion cu m is brackish water, and 4.08 billion cu m is water of unknown quality. The volume of water in five of the largest lakes (Iskanderkul', Yashil'kul', Sarezskoye, Karakul', and Sonkul') is 43.2 billion cu m, or 86% of the total volume of water in mountain lakes of the region. (See also W73-10448) (Josefson-USGS)
W73-10450

FOOD SUPPLY OF ROACH UNDERYEARLINGS RUTILUS RUTILUS (L.) IN THE MOZHAISKII RESERVOIR (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Ichthyology.
V. A. Grigorash, V. D. Spanovskaya, and T. V. Lebedeva.
Vopr Ikhtiol. Vol 12, No 3, p 504-512. 1972. Illus.
Identifiers: *Food (Fish), *Mozhaiskii Reservoir, *Roach, Rutilus-Rutilus, Underyearlings, USSR.

The daily rhythm of feeding, diet and growth rate for roach juveniles at different stages of development was investigated in the Mozhaiskii Reservoir during the first 10 yr of its existence. The hydrological regime and fish populations varied during this period. The daily ration for larvae during years with a good food supply varied from 21.7 to 26.4%, and for frys it was 15% of body weight. When food was scarce the indices were 12.8-14.6% and 7.9% respectively. The average daily weight increase during the larval period in good years was 13-20%, in bad years 5-9%.--Copyright 1973, Biological Abstracts, Inc.
W73-10458

DIURNAL PERIODICITY IN THE PHYTOPLANKTON ASSEMBLAGE OF A HIGH MOUNTAIN LAKE,
Innsbruck Univ. (Austria). Inst. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10461

AN ANALYSIS OF FACTORS GOVERNING PRODUCTIVITY IN LAKES AND RESERVOIRS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-10475

CHEMICAL EQUILIBRIUM MODELS OF LAKE KEYSTONE, OKLA.,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-10480

BIOLOGICAL NITROGEN FIXATION IN THE GREAT LAKES,
Wisconsin Univ., Madison, Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W73-10511

A FIELD FIXATION TECHNIQUE FOR DISSOLVED PHOSPHATE IN LAKE WATER,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W73-10519

THE CARBON CYCLE IN THE EPILIMNION OF TWO MICHIGAN LAKES,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05C.
W73-10538

DIATOMS IN ALKALINE, SALINE LAKES: ECOLOGY AND GEOCHEMICAL IMPLICATIONS,
Duke Univ., Durham, N.C. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10545

THE LIMNOLOGY OF STOCKBRIDGE BOWL, STOCKBRIDGE, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10561

DATA ON THE FEEDING OF THE YOUNGEST AGE GROUPS OF PIKE PERCH LUCIOPERCA LUCIOPERCA (L.) IN THE PSKOV-CHUDSKOE LAKE, (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
I. T. Nigonovskaya.
Vopr Ikhtiol. Vol 12, No 3, p 521-531, 1972. Illus.
Identifiers: Age groups (Fish), Feeding (Fish), Lakes, Lucioperca-Lucioperca, *Pike perch, *Pskov-Chudskoe Lake, Roach, Stint, USSR.

The diet and intensity of feeding were studied for pike perch in different regions of the Pskov-Chudskoe Lake during different seasons of the first 2 yr of life. Variations were determined by the abundance and accessibility of food. In the summer of the second yr prey of the same age as the pike-perch became inaccessible because of size. During the transfer to fooding on a new generation of prey, the index of stomach fullness decreased substantially. Stint was the most valuable food, compared to roach and perch.--Copyright 1973, Biological Abstracts, Inc.
W73-10613

AN ECOLOGICAL STUDY OF THREE FRESH WATER PONDS OF HYDERABAD-INDIA: II. THE ENVIRONMENT,
Osmania Univ., Hyderabad (India). Hydrobiology Lab.
For primary bibliographic entry see Field 05C.
W73-10625

THE EVALUATION OF SMALL BODIES OF WATER AS FUNCTIONAL ECOLOGICAL UNITS AND CONSEQUENCES FOR ECOLOGICAL TERMINOLOGY, (IN GERMAN),
Humboldt-Universitaet zu Berlin (East Germany). Museum fuer Naturkunde.
D. H. H. Kuehlmann.
Pol Arch Hydrobiol. Vol 19, No 1, p 123-150, 1972. Illus. English summary.
Identifiers: Ecological studies, Small water bodies, Terminology, *Food webs, *Ecosystems.

A new terminology for discussing ecosystems is introduced and illustrated by complex data from 3 different temporary pools. Cycles of O2, CO2 and N, as well as food webs networks were used as criteria. A conclusion emerges that the widely used term 'ecosystem' is not quite precise. A new terminology is suggested, referring to the close or open character of the cycle of metabolism in a reservoir.--Copyright 1973, Biological Abstracts, Inc.
W73-10640

THE PHYTOPLANKTON OF LAKE OVRE HEIMDALSVATN, CENTRAL SOUTH NORWAY, 1969-70,
Norwegian Inst. for Water Research, Oslo.
For primary bibliographic entry see Field 05C.
W73-10644

SOME ECOLOGICAL ASPECTS OF A NESTING COLONY OF HERONS,
Auburn Univ., Ala.
C. A. McDonald.
Ph D Dissertation, August 27, 1971. 118 p, 11 fig, 17 tab, 111 ref. OWRR A-010-ALA (2).

Descriptors: *Eutrophication, *Swamps, *Environmental effects, *Wading birds, *Georgia, Algae, Aquatic plants, Limnology, Aquatic productivity, Nutrients, Nitrates, Phosphates, Productivity.
Identifiers: Duckweed, *Herons, *Anhingas, Egrets.

A swamp in Clay County, Georgia, was studied to determine the ecological effects of a nesting colony of herons and anhingas. A similar swamp without herons was used for comparison. Within the colony area the understory was reduced or dying even. Larger numbers of dead limbs were found in the trees. These differences indicate a toxic effect on the vegetation by the excrements of the herons. Duckweed, forming a dense layer throughout the colony, was replaced during the summer by an algal mat composed primarily of Euglena. Neither the duckweed nor the algal mat was present in the swamp lacking the herons. Levels of nitrogen and phosphorus were higher in the swamp with the herons. The concentrations increased with an increase in the size of the colony and decreased with an increase in distance from the colony. (Knapp-USGS)
W73-10651

DATA ON SELECTED LAKES IN WASHINGTON, PART I,
Geological Survey, Tacoma, Wash.
M. R. Collings.
Geological Survey open-file report, 1973. 179 p, 86 fig, 1 tab.

Descriptors: *Lakes, *Limnology, *Thermocline, *Water quality, *Washington, Lake morphology, Data collections, Water temperatures, Thermal stratification, Dissolved oxygen, Mixing, Water circulation, Water pollution sources, Nutrients, Water level fluctuations, Precipitation (Atmospheric), Seasonal, Inflow, Discharge (Water).

Physiographic, physical, chemical, and floral characteristics are described for 22 lakes in western Washington State. Most of the lakes are used primarily for recreation, have origins related to continental and alpine glaciation, and are in areas underlain by glaciofluvial and (or) volcanic deposits that are covered by soils grading from gravel to clay. The cover of the lake basins ranges from conifer forests with some deciduous trees to grasslands and urban developments. The lakes range in surface area from 0.27 to 49.4 million square feet, in volume from 3.34 to 2,624 million cubic feet, in mean depth from 11.1 to 70.8 feet, and maximum depth from 20 to 117 feet. Generally the water-temperature profiles of the lakes show total mixing during the winter, with a uniform temperature-depth profile, and, beginning in the spring, thermal stratification which reaches a maximum during the summer, after which the mixing cycle begins again in the late fall. Profiles of the dissolved oxygen concentration in most of the lakes have the same relative shape as the temperature profiles. However, during the summer eight of the lakes also developed a pronounced positive heterograde zone of oxygen supersaturation in the central part of the depth profile. In several lakes, mineral and nutrient constituents increased from the epilimnion during summer stratification. Lake-level fluctuations reflect the precipitation pattern in western Washington. (Woodard-USGS)
W73-10654

A HIGH-MOUNTAIN LAKE (VORDERER FINSTERTALER SEE, KUEHTAI, AUSTRIA) AS A MODEL OF ENERGY FLOW THROUGH A FRESHWATER ECOSYSTEM, (IN GERMAN),
Innsbruck Univ. (Austria). Inst. of Zoology.
R. Pechlaner, G. Bretschko, P. Gollmann, H. Pfeifer, and M. Tilzer.
Verh Dtsch Zool Ges. 65, p 47-56, 1971. Illus. English summary.
Identifiers: Animals, *Austria, Biomass, Ecosystem, Energy, Flow, Lakes, Model studies, *Mountain lakes.

The extreme character of environmental conditions in lakes above timber line favors ecological research in such ecosystems both by reducing species diversity and by facilitating the analysis of the effects of abiotic factors on the species present. The changes were monitored in physical and chemical conditions and plant and animal life in Vorderer Finstertaler See since 1968. With the exception of benthic bacteria all trophic levels were studied for biomass and production rate of the dominant species. The results attained so far are summarized and the main paths of energy flow through the ecosystem are shown and discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-10870

CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY,
Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W73-10881

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STUDY,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-10882

PESTICIDE-SEDIMENT-WATER INTERACTIONS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 05B.
W73-10892

BIOLOGICAL PRODUCTIVITY OF LAKES KRIVOE AND KRUGLOE,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Instut.
For primary bibliographic entry see Field 05C.
W73-10896

THE SEASONAL VARIATION OF SOME ECOLOGICAL EFFICIENCIES AND PRODUCTION RATES IN THE PLANKTON COMMUNITY OF SEVERAL POLISH LAKES OF DIFFERENT TROPHY,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-10897

LIBRARY OF U. OF I. URBANA CHAMPAIGN

THE PRODUCTION PROCESSES IN SEVERAL POLISH LAKES,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology; and Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W73-10898

THE MODELLING OF THE ECOSYSTEM OF LAKE DALNEE ON AN ELECTRONIC COMPUTER,
For primary bibliographic entry see Field 05C.
W73-10899

BIOLOGICAL PRODUCTIVITY AND BALANCE OF ORGANIC SUBSTANCE AND ENERGY IN LAKE BAIKAL,
For primary bibliographic entry see Field 05C.
W73-10900

DISTRIBUTION PATTERN OF PHYTOPLANKTON AND BACTERIA, MICROBIAL DECOMPOSITION OF ORGANIC MATTER AND BACTERIAL PRODUCTION IN EUTROPHIC, STRATIFIED LAKE,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
For primary bibliographic entry see Field 05C.
W73-10901

THE PRODUCTION PROCESSES IN TWO HIGH-MOUNTAIN LAKES (VOR-DERER AND HINTERER FINSTERTALER SEE, KUHTAI, AUSTRIA),
Innsbruck Univ. (Austria). Inst. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10902

PRODUCTION AND DECOMPOSITION IN THE EULITTORAL ZONE OF LAKES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W73-10903

THE CHAR LAKE PROJECT. A STUDY OF ENERGY FLOW IN A HIGH ARCTIC LAKE,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10904

LAKE GEORGE, UGANDA. STUDIES ON A TROPICAL FRESHWATER ECOSYSTEM.
Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
For primary bibliographic entry see Field 05C.
W73-10905

FUNCTIONS AND INTERACTIONS OF DISSOLVED ORGANIC MATTER AND THE LITTORAL ZONE IN LAKE METABOLISM AND EUTROPHICATION,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 05C.
W73-10906

THE UNIQUENESS OF SALT LAKE ECOSYSTEMS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10907

SOME INTERIM RESULTS OF SOVIET IBP INVESTIGATIONS ON LAKES,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 05C.
W73-10908

BIOLOGICAL PRODUCTIVITY OF DIFFERENT TYPES OF LAKES,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 05C.
W73-10909

TROPHIC STRUCTURE OF LAKE TATSU-N-UMA, AN ACIDOTROPHIC LAKE IN JAPAN, WITH SPECIAL REFERENCE TO THE IMPORTANCE OF THE TERRESTRIAL COMMUNITY,
Yamagata Univ. (Japan). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-10910

PHYTOPLANKTON PRODUCTION, CHEMICAL AND PHYSICAL CONDITIONS IN LOCH LEVEN,
Nature Conservancy, Edinburgh (Scotland); and Freshwater Fisheries Lab., Pitlochry (Scotland).
For primary bibliographic entry see Field 05C.
W73-10922

THE REGULATION OF NET PRIMARY PRODUCTION IN LAKE GEORGE, UGANDA, EAST AFRICA,
Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
For primary bibliographic entry see Field 05C.
W73-10926

COMPARATIVE TRENDS OF PRIMARY PRODUCTIVITY AND SOME CHEMICAL PARAMETERS IN LAKE MAGGIORE ON A PLURIANNUAL BASIS,
Istituto Italino di Idrobiologia, Pallanza (Italy).
For primary bibliographic entry see Field 05C.
W73-10927

COMPARISON OF THE PHYSICAL AND CHEMCIAL ENVIRONMENTS OF VOLTA LAKE AND LAKE NASSER,
Lake Nasser Development Centre, Aswan (Egypt).
For primary bibliographic entry see Field 05C.
W73-10931

SOME CHARACTERISTICS OF A SHALLOW ENDORHEIC LAKE IN ITS DRYING PHASE AND ITS REVOVERY PHASE. LAKE CHILWA (MALAWI),
Malawi Univ., Limbe.
For primary bibliographic entry see Field 05C.
W73-10932

COMPLEXING PROPERTIES OF NITRILOTRIACETIC ACID IN THE LAKE ENVIRONMENT,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 05C.
W73-10942

EFFECT OF BOTTOM TOPOGRAPHY, EDDY DIFFUSIVITY, AND WIND VARIATION ON CIRCULATION IN A TWO-LAYER STRATIFIED LAKE,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. T. Gedney, W. Lick, and F. B. Molls.
Available from NTIS, Springfield, Va 22151 as NASA TN D-7235. Price $3.00 printed copy; $0.95 microfiche. NASA Technical Note D-7235, March 1973. 44 p, 5 fig, 9 ref.

Descriptors: *Water circulation, *Stratified flow, *Lakes, Lake morphology, Winds, Limnology, Model studies, Mathematical models, Thermocline, Epilimnion, Hypolimnion, Diffusion, Eddies, Analytical techniques, Forecasting, Wind velocity, Lake morphometry.
Identifiers: Lake bottom topography.

Observations of stratified lakes suggest that during steady wind periods they may be modeled by considering the lake to be made up of two homogeneous layers, each with different densities and eddy diffusivities with the interface between the two layers being located at the thermocline. The position of the thermocline and the velocities in both layers are calculated from an asymptotic solution of the shallow lake equations when the Ekman number in the epilimnion (upper layer) is of order one, but the rato of hypolimnion (lower layer) to epilimnion eddy diffusivities is much less than one. Large differences in the thermocline shape and the velocities occur between the solution for uniform wind stress and the one for unit order wind stress gradients. For the latter solution the hypolimnion eddy diffusivity magnitude and the bottom topography have a large and important effect. (Woodard-USGS)
W73-10973

ECOLOGY OF VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY,
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11001

DISSOLVED OXYGEN AND TEMPERATURE IN A STRATIFIED LAKE,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-11005

2I. Water in Plants

INFLUENCE OF VEGETATION AND SUBSTRATE ON STREAMWATER CHEMISTRY IN NORTHERN UTAH,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 05B.
W73-10413

INTERCEPTION OF PRECIPITATION BY VEGETATION AND ITS DETERMINATION IN WATER-BALANCE INVESTIGATIONS (PEREKHVAT ATMOSFERNYKH OSADKOV RASTITEL'NOST'YU I YEGO UCHET PRI VODNOBALANSOVYKH ISSLEDOVANIYAKH),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 02B.
W73-10453

NATURE OF LARVAL AND JUVENILE GROWTH OF SOME FRESHWATER FISH AT DIFFERENT STATES OF DEVELOPMENT, (IN RUSSIAN),
Kazan State Univ. (USSR). Dept. of Vertebrate Zoology.
V. A. Kuznetsov.
Vopr Ikhtiol, Vol 12, No 3, p 479-489, 1972. Illus.
Identifiers: Bream, Custacea, *Fresh water fish, *Juvenile growth, *Larval growth, Perch, Pike, Plankton, Roach, Zooplankton.

On the basis of observations of bream, roach, perch, pike-perch and pike juveniles and larvae at different stages of development, 5 periods of

growth characterized by growth intensity and associated with diet were differentiated. There were 2 critical periods for the growth of carp and perch larvae: after yolk resorption and transfer to external food and during the transfer from a diet of small zooplankton to crustaceous zooplankton. During these periods the intensity of larval growth decreased. The second critical period was not applicable to pike.--Copyright 1973, Biological Abstracts, Inc.
W73-10468

A NEW SPECIES OF PSEUDOCODIUM (CHLOROPHYTA, SIPHONALES) FROM THE WEST COAST OF FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-10470

SEASONAL DYNAMICS OF BIOLOGICAL INDICES OF ROACH RUTILUS RUTILUS (L.) WITH DIFFERENT FOOD SUPPLIES, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Ichthyology.
T. N. Lyagina.
Vopr Ikhtiol. Vol 12, No 2, p 240-257. 1972. Illus.
Identifiers: Biological indices, Food (Fish), Indices, *Roach, Rutilus-Rutilus, *Seasonal.

The dynamics of linear growth, weight increase, condition, fatness, relative weight of the liver, and maturity of a single age group from April to Oct. in different years were investigated. The indices depended on food supply. Variation in the first 4 categories was unstable and depended mainly on fattening conditions during a given year. Variation in the hepatic index was consistent and the coefficient of maturity was the same in different years. Evidently variations in these indices are determined to a large degree by endogenous factors. A sharp increase in food supply during the spring and feeding exclusively on animal food, followed by a sharp deterioration of feeding conditions during a single spawning period led to elimination of some of the eggs. This resulted in a correspondence between the number of developing eggs and the available resources.--Copyright 1973, Biological Abstracts, Inc.
W73-10484

DISTRIBUTION OF THE SPAWNING PORTION OF THE SAURY POPULATION COLOLABIS SATRA (BREV.) IN THE PACIFIC OCEAN AND SEA OF JAPAN IN RELATION TO THE TEMPERATURE OF THE SURFACE WATER LAYER, (IN RUSSIAN),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
Yu V. Novikov.
Vopr Ikhtiol. Vol 12, No 3, p 572-576. 1972. Illus.
Identifiers: Cololabis-Saira, Distribution patterns (Fish), Ocean, Pacific Ocean, *Saury (Spawning), *Sea of Japan, Spawning, Temperature.

Spawning occurs under about the same hydrological conditions throughout the year. Spawning areas change with the temperature of the water. During the winter the northern portion of the East China Sea and waters off the southern shores of Kyushu, Shikoku and Honshu are areas of group spawning for saury from the Sea of Japan and Pacific Ocean. In autumn the center moves south, in the spring to the north. Saury inhabiting the Sea of Japan and the waters of East Japan belong to the same stock.--Copyright 1973, Biological Abstracts, Inc.
W73-10521

DESICCATION INJURY IN MOSSES: II. THE EFFECT OF MOISTURE STRESS ON ENZYME LEVELS,
Manchester Univ. (England). Dept. of Botany.
G. R. Stewart, and J. A. Lee.
New Phytol. Vol 71, No 3, p 461-466. 1972. Illus.
Identifiers: Acrocladium-cuspidatum, Dehydrogenase, Desiccation,*Enzymes, Glutathione, Glyceraldehyde, Moisture, *Mosses, NADP, Oxidation, Phosphates, Photosynthesis, Shoots, Sulfhydryl.

The effects of desiccation on the activity of several enzymes from Acrocladium cuspidatum were investigated; with the exception of glyceraldehyde 3-phosphate dehydrogenase prolonged desiccation had little effect on the enzymes studied. The response of the NADP+-dependent glyceraldehyde 3-phosphate dehydrogenase to sulphydryl compounds changes during desiccation; when extracted from desiccated shoots it showed a 6-20 times stimulation of activity in the presence of reduced glutathione, that from fresh shoots showed only a 2-fold stimulation. The effects of glutathione on the enzyme's activity were examined in species with varying resistance to desiccation. It is suggested that the decline in photosynthesis during desiccation may be explained in part by the oxidation of sulphydryl residues essential for the catalytic activity of the NADP+-glyceraldehyde 3-phosphate dehydrogenase. (See also W73-00010)--Copyright 1972, Biological Abstracts, Inc.
W73-10522

THE DETERMINATION OF TOTAL NITROGEN IN PLANT MATERIALS WITH AN AUTOMATIC NITROGEN ANALYSER,
International Atomic Energy Agency, Seibersdorf (Austria).
For primary bibliographic entry see Field 05A.
W73-10530

DESMIDS FROM SOUTHEAST UNITED STATES OF AMERICA, (DESMIDIEEN AUS DEM SUDOSTEN DER VEREINIGTEN STAATEN VON AMERIKA),
For primary bibliographic entry see Field 05A.
W73-10546

MIGRATION OF STURGEON (ACIPENSERIDAE) IN THE VOLGA DURING WINTER, (IN RUSSIAN),
Tsentralnyi Nauchno-Issledovatelskii Institut Osetrovogo Khozyaistva, Astrakhan (USSR).
A. V. Pavlov, and A. P. Slivka.
Vopr Ikhtiol. Vol 12, No 3, p 584-588. 1972.
Identifiers: Acipenseridae, Crabs, Invertebrates, Leech, *Migration (Spawning), Parasites, *Sturgeon, *Volga River, Winter.

Studiies of great sturgeon and Russian sturgeon from 1968-70 in different parts of the Volga confirmed the existence of a spawning migration and post-spawning downstream migration during the winter. Under the ice great sturgeon migrated in greater numbers than Russian sturgeon. As opposed to other seasons, the intensity of movement and downstream migration was substantially weaker. Downstream migrants led an active life in wintering areas. As a rule they ate fish, crabs and other bottom-dwelling invertebrates. The rate of infestation with parasites, such as leeches, was lower than in other seasons. Resorption of the eggs during winter in some specimens indicated disorders in the normal process of gonad maturation which developed under new conditions.--Copyright 1973, Biological Abstracts, Inc.
W73-10614

CLIMATE AND DEVELOPMENT OF HELMINTHS: I. CLIMATOLOGY AND HELMINTH DEVELOPMENT, (IN FRENCH),
Ecole Nationale Veterinaire de Lyon (France). Laboratoire de Recherches de la Chaire de Parasitologie.
J. Euzeby.
Rev Med Vet (Toulouse). Vol 123, No 5, p 637-655, 1972. English summary.
Identifiers: Climates, Climatology, *Helminths, Parasitic worms.

The features of climate are reviewed along with the influence of climate on the exogenous phase of the life cycle of helminths and on the survival of free-living stages of these parasites. Some consequences of the ability of parasitic worms to infect their hosts are presented.--Copyright 1973, Biological Abstracts, Inc.
W73-10630

ON THE GEOTROPIC GROWTH OF THE ROOT, (IN GERMAN),
L. Kutschera-Mitter.
Beitr Biol Pflanz. Vol 47, No 3, p 371-436, 1971. Illus. English summary.
Identifiers: Evaporation, *Geotropic growth, Humidity, *Root system, Temperature, Water uptake (Plants).

The root systems of perennial plants, being dependent on the changes of soil temperature, are often developed in 3 growth zones, showing varied geotropical behavior in these. Experiments were made with seed plants of various species, and the influence of different temperatures and of different relative air humidity on the geotropic behavior of the plant and the resulting changes in the tissues were observed. The importance of the root cap on geotropism was also investigated, as well as the influence of the centrifugal force. In order to determine differences in transpiration, the temperatures on the upper and lower sides of horizontally placed moist objects were measured. Previous explanations of geotropism, as the statolith theory or the theory about growth substances are incompatible with the shortness of the induction period. Neither do they explain the great influence of temperature changes on geotropic growth. According to field observations and experiments, the reason for positive geotropic growth of the root is the growth of the elongation zone is dependent on external water and water molecules escape faster on the upper side, and the slime of the root cap moves downward so that the cells of the upper side come in contact with the air earlier than those of the lower side. The faster escape of the vapor from the upper side caused by gravity leads to a greater easing of tension of the cell walls, and to cooling due to evaporation. That is why the absorbing power of the cells and the formation of condensed water are greater there than on the lower side. In consequence elongation and water uptake of the cells of the upper side are greater. The difference increases with changes in temperature and relative humidity.--Copyright 1973, Biological Abstracts, Inc.
W73-10632

DEPENDENCE OF BLACK FLY LARVAE DISTRIBUTION ON THE OXYGEN CONTENT IN THE WATER, THE SPEED OF FLOW AND THE NUTRITIVE VALUE OF WATER STREAMS, (IN RUSSIAN),
Ivanovskii Gosudartsvennyi Meditsinskii Institut (USSR). Dept. of Biology.
L. A. Ivashchenko.
Med Parazitol Parazit Bolezn. Vol 41, No 2, p 217-220, 1972. English summary.
Identifiers: *Black fly larvae, Distribution, Larvae, Nutritive value, *Oxygen, Streams.

Dispersal of larvae of black flies of different species depends upon the extent of water saturation with O2, rate of flow, biological requirement of

water in O2, and nutritive value of the water stream. The nutritive value of the stream was determined as the value resulting from multiplying by the rate of flow of the water. Species selectivity by all these values characterizing the biotope was observed. The definite correlation between the density of larvae, rate of flow, and nutritive value of the stream was observed only in biotopes of similar types or in different parts of the same water stream.--Copyright 1973, Biological Abstracts, Inc.
W73-10639

SCALE STRUCTURE OF THE AMUR KETA ONCORHYNCHUS KETA (WALB.) AS AN INDEX OF GROWTH AND LIVING CONDITIONS DURING THE FRESHWATER STAGE OF LIFE, (IN RUSSIAN),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyalistva i Okeanografii, Khabarovsk (USSR). Lab. of Anadromous Salmon.
Yu S. Roslyi.
Vopr Ikhtiol. Vol 12, No 3, p 532-544. 1972. Illus.
Identifiers: *Amur Keta, Growth (Fish), Oncorhynchus-Keta, *Scale structure (Fish).

The effects of the river current on the growth of Amur keta during the early part of the first year of life was considered. Differences in the number of sclerites in the first annual growth zone of the scale suggested a link between keta growth in the first year and living conditions during the freshwater period. In years of low flow rates during the downstream migration period, keta juveniles grew better in the rivers and brackish littoral waters.--Copyright 1973, Biological Abstracts, Inc.
W73-10642

SEASONAL FLUCTUATIONS IN THE WATER CONTENT OF VARIOUS PLANT FORMATIONS IN HAUTE-ARDENNE,
Louvain Univ. (Belgium). Laboratoire d'Ecologie Vegetale.
C. Renard.
Mem Soc R Bot Belg. 5, p 5-139. 1971.
Identifiers: *Beech, *Belgium (Haute-Ardenne), Bogs, Forests, Meadow, Norway, Regulation, *Seasonal, *Spruce, Yield.

Four plant communities (beech forest, Norway spruce plantation, meadow, bog) were studied in the 'Plateau des Tailles' (600 m above sea level, Belgian 'Haute-Ardenne'). The 4 communities were studied from a phenological point of view. At the same time, samples were collected in the beech forest and in the spruce plantation, from Jan. 1965 to May, 1966. From these, trends of water content variations during the year (for different plant parts) and dry weight (for some plant parts, only) were obtained. In both cases, the average water weight was the greatest during the winter, and the smallest during the period of active growth. From a detailed analysis of the variations of that parameter, it can be concluded that the older plant parts (heartwood) are water refilled during the winter. The meadow and the bog were studied from June, 1966 to Oct., 1967. Mean dry biomasses (tons/ha) and water contents were estimated. Water content was the greatest in winter, and the smallest during active growth. Dry biomass and water contents of the 4 stands were calculated at 4 characteristic times of the year. The differences between the annual maximum and minimum water contents, expressed in water height, is 2.5 mm for the meadow, 3.4 mm for the beech forest 6.4 mm for the spruce plantation, and 12.4 mm for the bog vegetation. The times at which the maxima and minima were obtained emphasize the importance of the bog for water yield regulation.--Copyright 1973, Biological Abstracts, Inc.
W73-10643

STRATIFICATION OF TROPICAL EPIPHYLLS,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
Don R. Reynolds.
Kalikasan Philipp J Biol. Vol 1, No 1, p 7-10. 1972.
Identifiers: *Costa-Rica, Environmental studies, *Epiphylls (Tropical), Moisture, *Stratification, Tropical.

Epiphylls in a Costa Rican rain forest exhibited a definite stratification. The vertical variance was correlated with environmental factors, the most important of which was available moisture.--Copyright 1973, Biological Abstracts, Inc.
W73-10645

INSECT-PRODUCTION OF BLOOD-SUCKING MOSQUITOES CULEX PIPIENS L. AND ALLOTHEOBALDIA LONGIAREOLATA MACQ. IN SHOWER INSTALLATIONS UNDER CONDITIONS OF A HOT CLIMATE, (IN RUSSIAN),
V. L. Kulanin.
Med Parazitol Parazit Bolezn. Vol 40, No 5, p 622-623. 1971. English summary.
Identifiers: Allotheobaldia-Longiareolata, Climates (Tropical), Culex-Pipiens, *Insect production, Installations, *Mosquitoes.

Additional water bodies suitable for breeding consist of showers (barrels, tanks), refuse and sewer pits, water supply manholes and sewer systems, and temporary lavatories. These additional water bodies should be regularly examined, since they are sometimes the main sources of A. longiareolata and C. pipiens mosquitoes in towns with hot climates. Recommendations are given for private persons and organizations to prevent mosquito breeding in such water bodies.--Copyright 1973, Biological Abstracts, Inc.
W73-10647

BREEDING PLACES OF MOSQUITOES IN THE AREA OF THE OERTZE LOWLAND (LUENBURGER HEIDE): 1. BREEDING PLACES OF AEDES PUNCTOR KIRBY,
E. Ising.
Zool Beitr. Vol 17, No 2/3, p 435-456. 1971. Illus.
Identifiers: Aedes-Punctor, *Breeding, Lowlands, *Mosquitoes, Places, *Germany (Oertze Lowland).

In 1969 and 1970, 30 breeding waters of Aedinae, all containing A. punctor, were observed in the Oertze Lowland (West Germany). Of these, 7 waters contained only A. punctor, while 23 others contained 8-90% A. punctor larvae in association with A. excrucicans, A. annulipes, A. cinereus and/or A. communis. The breeding waters are precipitation pools or puddles existing from several wk to about 4 mo. A considerable number of the waters are very similar to peat waters with reference to location, meterological and geophysical conditions of the location, depth, temperature and composition of the water and vegetation. Analysis of breeding behavior of A. punctor in the investigated area and data from literature show that its acidophilia is not species-specific and is not suitable for characterization of its preference behavior. Classification of A. punctor as a tyrphophilic species (living on peat) is supported by occasional authochthonous forest populations.--Copyright 1973, Biological Abstracts, Inc.
W73-10648

EFFECTS OF HEAVY TENDING TREATMENTS ON THE MICROCLIMATE IN YOUNG CROPS OF SPRUCE, (IN CZECH),
Vysoka Skola Zemedelska, Brno (Czechoslovakia). Faculty of Agronomy.
M. Novakova.
Acta Univ Agric Fac Silvic. Vol 40, No 3, p 187-200. 1971. Illus. English summary.
Identifiers: Climates, Crops, Evaporation, Forests, Humidity, Microclimate, Soils, *Spruce, Temperature, *Tending treatments.

The plants examined were exposed separately to heavy, moderate, and zero tending treatments. Comparisons were made of the values measured in the separate treatments for light, soil temperature determined at 2 and 5 cm depths, air temperature measured at 5 and 150 cm above the soil surface, temperature amplitudes, relative humidities at 5 and 150 cm above the soil surface, and evaporation.--Copyright 1973, Biological Abstracts, Inc.
W73-10649

STUDY OF THE STATE OF WATER AND WATER EXCHANGE OF A PLANT CELL BY IR ABSORPTION SPECTRA, (IN RUSSIAN),
Kazan State Univ., (USSR).
For primary bibliographic entry see Field 07B.
W73-10702

LEAF DIFFUSION RESISTANCE TO WATER VAPOUR AND ITS DIRECT MEASUREMENT: I. INTRODUCTION AND REVIEW CONCERNING RELEVANT FACTORS AND METHODS,
Agricultural Univ., Wageningen (Netherlands). Lab. of Physiological Meteorology.
For primary bibliographic entry see Field 07B.
W73-10703

AN EVALUATION OF THE POSSIBLE EFFECTS OF WATER DIVERSION OF THE CONNECTICUT RIVER ON THE BIOLOGY OF ANADROMOUS FISH IN THE RIVER,
Massachusetts Univ., Amherst.
J. A. McCann, and E. R. McGrath.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center, Publication No. 25, 1973. Appendix C, 14 p, 47 ref. OWRR C-2169 (No.3377) (1).

Descriptors: *Diversion, *Environmental effects, *Anadromous fish, Fish migration, *Pumped storage, *Connecticut River, *Inter-basin transfers.
Identifiers: *Flood water diversions, American shad, Atlantic salmon, Sea lamprey, Blueback herring, Alewife.

The possible effects of the flood water diversions, including the operation of a pumped storage facility on Northfield Mountain, on anadromous fish in the Connecticut River is discussed. The fish under consideration are the American shad, blueback herring, alewife, sea lamprey, and Atlantic salmon. The influences and relationships involved are very complex but two key factors are water flow and temperature. In particular, the upstream migration of the American shad and the Atlantic salmon are closely related to spring and fall flood water conditions. These flood flows would be altered by the proposed diversions but probably not enough to affect the migration. On the other hand increased diversions or diversions during normal flows may have significant effects. Also, in the vicinity of the intakes, there may be problems due to the periodic reversal of flows and the loss of fish into the intakes. It is recommended that studies be made at the existing facilities at Holyoke Dam to relate flood flow reduction and other factors to the passage of fish over the dam. (See also W73-10726). (Elfers - North Carolina).
W73-10729

THE EFFECTS OF HUMIC ACID ON THE GROWTH AND DIGESTIBILITY IN FISH FED BROWN FISH MEAL AND SOYBEAN MEAL DIETS, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
Y. Satomi, and H. Tanaka.
Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 2, p 179-195. 1971. Illus. English summary.
Identifiers: Diets (Fish), Digestibility, Fish meal, *Growth, *Humic acid, Soybean meal.

In most cases, fish fed test diets showed nearly equal or slightly better growth when compared with control fish fed commercial diet although the average body weight gain on test diets were inferior to those of the control diet.--Copyright 1973, Biological Abstracts, Inc.
W73-10804

A PURIFIED TEST DIET FOR THE EEL, ANGUILLA JAPONICA,
Freshwater Fisheries Research Lab., Tokyo (Japan).
S. Arai, T. Nose, and Y. Hashmioto.
Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 2, p 161-178. 1971. Illus.
Identifiers: Anguilla-Japonica, *Diets, *Eel, Purified test diet.

Attempts were made to establish a purified test diet which fulfills the nutritional requirements of eel, by modifying the test diet devised by Halver (1957) for salmoids. As fat source, corn oil, cod liver oil and their mixture in 2:1 were tested at a 12% level in the diet. The mixed oil was the most favorable for growth and cod liver oil the least. Eels fed on a corn oil diet which is scanty in linolenic acid showed a fatty acid pattern characterized by the absence of highly unsaturated fatty acids supposed to be derived from linolenic acid. The level of mineral mixture was an important factor for growth. The eel, kept on diets either containing 1% mineral mixture or lacking it, showed cessation of growth in 2 wk, followed by both loss of their body weight and high mortality. All the dead fish revealed scoliosis and lordosis. The higher the level of mineral mixture, the better was the growth. At a level as high as 8%, the body weight gain was maximum. As supplement, a combination of 0.5% L-tryptophan and 1% L-cystine was much better than that of 0.5% L-tryptophan and 1% DL-methionine. A further addition of 0.5% L-threonine, however, depressed growth remarkable, suggesting the importance of amino acid balance in protein nutrition of eel. A purified test diet consisting of casein 54, gelatin 15, dextrin 8, corn oil 6, cod liver oil 3, cellulose power with vitamin mixture 6, mineral mixture 7, L-tryptophan 0.5, L-cystine 1 and water 200 maintained the much improved growth for 14 wk without inducing any abnormality in eels.--Copyright 1973, Biological Abstracts, Inc.
W73-10805

DESERT PRODUCTIVITY AND ITS DYNAMICS IN CONNECTION WITH METEOROLOGY, (IN RUSSIAN),
A. P. Fedoseev.
Probl Osvoeniya Pustyn'. 3. p 3-9. 1972. Illus. English summary.
Identifiers: Computers, *Deserts, Dynamics, Forecasting, Meteorology, Productivity, Range, Yield.

Prognostication of range plant yield includes forecast of meteorological and biological phenomena. Biological regularities are, mainly, expressed by nonlinear correlation. Thus, together with methods of statistic forecast in agrometeorological forecasting, the nonlinear correlation should be used. Of great help is the utilization of computers and programmed development of forecasting models. Prospective yield prognostication is possible with the mathematical model 'weather yield,' the structure of which expresses correlation between hydrometeorological conditions and vital activity of plants-photosynthesis, respiration, growth and development.--Copyright 1973, Biological Abstracts, Inc.
W73-10808

COMPARATIVE STUDY OF THE PLAGIOTHECIACEAE OF BELGIUM WITH REGARD TO CERTAIN FACTORS INFLUENCING THEIR WATER RELATIONSHIPS WITH THE ENVIRONMENT, (IN FRENCH),
Namur Univ. (Belgium). Dept. of Botany.
J. Lefebvre.
Bull Soc R Bot Belg. Vol 103, No 1, p 63-70. 1970. Illus. English summary.
Identifiers: *Belgium, Isopterygium, *Osmotic potential, *Plagiothecia ceae, Plagiothecium-Curvifolium, Plagiothecium-Denticulatum, Plagiothecium-Denticulatum-Var-Denti, Plagiothecium-Denticulatum-Var-Undul, Plagiothecium-Undulatum, Sap, Taxonomy, Turgidity, Vacuolar, Water loss.

The principal species of Belgian Plagiothecia ceae were studied with respect to 4 characters related to water economy: osmotic potential of vacuolar sap, relative turgidity, water-content of fresh samples, and rate of water-loss. Data on water relations is used to supplement other data concerning the taxonomy of Isopterygium and Plagiothecium, P. undulatum and other Plagiothecium s.s., and P. laetum and P. curvifolium. Similarity of osmotic potential parameters justifies retention of P. denticulatum var. denticulatum and var. undulatum in the same species.--Copyright 1973, Biological Abstracts, Inc.
W73-10811

DENSITY GRADIENT CENTRIFUGATION AS AN AID TO SORTING PLANKTONIC ORGANISMS: I. GRADIENT MATERIALS,
Marine Biological Lab., Woods Hole, Mass.
R. A. Bowen, J. M. St. Onge, J. B. Colton, Jr., and C. A. Price.
Mar Biol (Berl). Vol 14, No 3, p 242-247. 1972. Illus.
Identifiers: *Centrifugation (Density gradient), Fish eggs, Invertebrates, Marine organisms, *Plankton, Salpa, *Sorting, Zooplankton.

Fish eggs and larvae can be separated from invertebrate zooplankton by centrifugation in gradients of sucrose or silica. Preserved samples of invertebrate zooplankton, fish eggs, and fish larvae, representing a typical assortment of marine plankton, were layered over linear gradients of 25 to 60% w/w (weight) sucrose or 0 to 15% w/w silica (as Ludox AM) in 100 c3 swinging buckets and centrifuged for 1 hr at 1000 rpm (revs per min). In sucrose gradients, the invertebrate zooplankton were confined to the 2 ends of the gradient, while 85% of the fish eggs were recovered from an intermediate zone (27.5 to 55% w/w). In Ludox AM, the fish eggs banded in a narrow region between 2 and 3% w/w, while fish larvae banded at the bottom of the gradient between 10 and 14% w/w. Of the 6 dominant classes of zooplankton, only Salpa overlapped appreciably with the fish larvae. Of the gradient materials tested, Ludox AM offers the most advantages; sucrose may also be useful for subfractionation. Gradients of sodium bromide and dextran have been found to be totally unsuitable.--Copyright 1973, Biological Abstracts, Inc.
W73-10813

STUDIES ON THE CARP CULTURE IN RUNNING WATER POND: V. OXYGEN SUPPLY AND CONSUMPTION IN THE FISH POND AND ESTIMATION OF THE AMOUNT OF HARVESTABLE FISH IN A POND, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
K. Chiba.
Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 2, p 151-160. 1971. Illus. English summary.
Identifiers: *Carp, Culture, Fish, Harvestable fish, *Oxygen, Ponds.

Oxygen consumption rate of carp (50-130 g) in active condition was measured under various water temperatures (16-30 C). The relation between oxygen consumption rate (Y) and water temperature (X) is expressed by the following formula: $\log Y = \pm 0.0307X + 1.4072$. Oxygen consumption rate of pond water varied from 0-0.24 cc/1. No clear diurnal changes were observed. Oxygen values obtained from other areas are compared. Seasonal variations and the ratio of average fish weight at harvest to that at maximum temperature are indicated. (See also W72-07700)--Copyright 1973, Biological Abstracts, Inc.
W73-10815

2J. Erosion and Sedimentation

METHODS OF MEASURING MASS WASTING; REVIEW AND CRITIQUE,
Portland State Univ., Oregon.
L. W. Price, and C. S. Alexander.
Proceedings of the Association of American Geographers, Vol 3, p 135-139, 1971. 34 ref.

Descriptors: *Mass wasting, *Erosion, *Slopes, Movement, Measurement, Analytical techniques, Erosion rates, Creep, Avalanches, Landslides, Mudflows, Rockslides, Mass transfer, Strain gages, Instrumentation.
Identifiers: *Mass wasting meter, Radioactive devices, Young pit, Vertical velocity column.

The use of more precise and better controlled methods of measuring mass wasting is presented. In situ rocks, small pins, dowels, and cone targets are better devices for measuring surface movement than are wooden stakes. Methods for monitoring movement with depth include: the Young pit, vertical velocity column, mass wasting meter, radioactive devices, and strain gauges. The latter two show the greatest promise. The value and significance of field measurements in geomorphology are limited by the techniques used. (Woodard-USGS)
W73-10422

RECONNAISSANCE OF CHEMICAL QUALITY OF SURFACE WATER AND FLUVIAL SEDIMENT IN THE PRICE RIVER BASIN, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02K.
W73-10423

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY,
Geological Survey, Philadelphia, Pa.
For primary bibliographic entry see Field 02L.
W73-10425

TIDAL CURRENT ASYMMETRIES OVER THE NORFOLK SANDBANKS,
Cambridge Univ., (England). Dept. of Applied Mathematics and Theoretical Physics.
For primary bibliographic entry see Field 02E.
W73-10430

THE SIGNIFICANCE OF WAVE PARAMETERS IN THE SORTING OF BEACH PEBBLES,
Unit of Coastal Sedimentation, Taunton (England).
R. Gleason, and P. J. Hardcastle.
Estuarine and Coastal Marine Science, Vol 1, No 1, p 11-18, January 1973. 6 fig, 1 tab, 19 ref.

Descriptors: *Sediment sorting, *Beaches, *Gravels, *Surf, *Littoral drift, Waves (Water), Sediment transport, Sedimentation, Particle size, Sedimentology.
Identifiers: Chesil Beach (England).

On Chesil Beach, Dorset, England, longshore drift sorting is dependent on the angle of swell approach and wave height. The vertical sorting is dependent on the wave frequency and wave height. The processes are reflected most significantly in the mean short diameters of the pebbles. Chesil Beach is a graded shingle structure approximately 18 km long with mean pebble long diameter increasing from 1.5 cm at West Bexington to 5.5 cm at Chesilton. The grading is linear over much of its

length but increases exponentially over the eastern 5 km. In the area under discussion the whole of the beach above low water mark is composed of material of pebble size or above although finer fractions are sometimes present at or below low water mark. (Knapp-USGS)
W73-10431

THE EVOLUTION OF LEWES HARBOR,
Delaware Univ., Newark. Dept of Geology.
J. C. Kraft, and R. L. Caulk.
Available from NTIS, Springfield, Va. 22151 AD-753 860. Price $3.00 printed copy; $0.95 microfiche. Delaware University College of Marine Studies Technical Report No 10, November 1972. 58 p, 22 fig, 14 ref. ONR-GP Contract N00014-69-A0407.

Descriptors: *Coasts, *Harbors, *Sedimentation, *Sediment transport, *Delaware, Erosion, Sedimentation rates, Breakwaters, Sand spits, Geomorphology, Environmental effects, Ocean currents, Shores, Littoral drift.
Identifiers: *Lewes Harbor (Del).

Lewes Harbor, Delaware, is being destroyed by silting and erosional processes. In addition, the effectiveness of the Harbor of Refuge has become more limited, in part by processes in coastal change and in part by changes in the nature of shipping patterns. Short term projection of changes in coastal morphology indicates that Cape Henlopen will join the inner breakwater of Lewes Harbor in the short term future. With this event, the complete silting of the inner harbor should occur. Ultimately, over the next century, the present inner harbor of Lewes should become a shallow tidal flat bordered by a coastal marsh. Over the long term (3 to 500 years) period a contining erosion of the Atlantic shore will cause the Atlantic shoreline area to merge with the inner Delaware breakwater. Further intrusion of man into this area may drastically alter these predictions. (Woodard-USGS)
W73-10438

A TWO-LAYER MODEL OF MUD TRANSPORT IN THE THAMES ESTUARY,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 02L.
W73-10443

THE LIMNOLOGY OF STOCKBRIDGE BOWL, STOCKBRIDGE, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10561

EFFECTS OF URBANIZATION OF SEDIMENTATION AND FLOODFLOWS IN COLMA CREEK BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04C.
W73-10653

ACCUMULATION OF FALLOUT CESIUM 137 IN SOILS AND SEDIMENTS IN SELECTED WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05B.
W73-10667

FATE OF SUSPENDED SEDIMENT DURING BASIN RECHARGE,
Southwestern Great Plains Research Center, Bushland, Tex.
D. W. Goss, S. J. Smith, B. A. Stewart, and O. R. Jones.
Water Resources Research, Vol 9, No 3, p 668-675, June 1973. 2 fig, 4 tab, 28 ref.

Descriptors: *Suspended load, *Artificial recharge, *Recharge ponds, Sedimentation, Silts, Silting, Desilting, Infiltration, Pit recharge, Tracers, Clays.

Suspended sediment was tagged with the radioisotope Cs-134 to determine the extent of its movement into materials underlying recharge basins and to aid in evaluating the effect of its accumulation on infiltration rates and the basin life. When openings of naturally occurring large pores were allowed to remain at the basin surface, 50% of the sediment moved deeper than 18 inches. However, when large-pore openings at the surface were destroyed by cultivation, over 90% of the suspended sediment was retained in the upper 1 inch. Most of this sediment could easily be removed. The suspended sediment that moved deeper than about 0.15 inch (the depth removed after each recharge cycle) did not noticeably reduce infiltration rates in an experimental basin. (Knapp-USGS)
W73-10668

COASTAL EROSION IN THE NILE DELTA,
United Nations Educational, Scientific and Cultural Organization, New York.
Ev Nielsen.
Nature and Resources, Vol 9, No 1, p 14-18, January-March 1973. 1 fig, 1 ref.

Descriptors: *Soil erosion, *Coasts, *Deltas, *Sediment control, *Africa, Flood plains, Erosion control, River basins, Planning, Programs, Dams, Reservoirs, Environmental effects, Streamflow, Sediment transport, Project purposes, Data collections.
Identifiers: *Nile delta (Africa), Egypt.

Following the planning and the construction of the Aswan High Dam, closed off in 1964, Egyptian scientists have had to consider the question of the nature and scope of the changes to the Nile valley and to the Nile delta and its shores, that would result from impounding the seasonal Nile flood waters with their sediment load in the dam reservoir (Lake Nasser). The objective of the present phase of the project, approved by the United Nations Development Program, is to assist the government in carrying out a comprehensive scientific study of the causes of coastal erosion in the Nile delta area, and in the preparation of a plan for coastal protection works, including recommendations for design and construction. Operations to be carried out by the project will provide for: (a) a detailed description of the Nile delta shore in terms of geography, geology, morphology as well as hydraulic, littoral drift and erosion conditions; and (b) on the basis of evaluation of the data, recommendations for the design and construction of the required coastal protection works. (Woodard-USGS)
W73-10681

ANNOTATED BIBLIOGRAPHY AND COMMENTS ON SEDIMENTATION IN THE CONNECTICUT RIVER,
Vermont Univ., Burlington.
D. P. Fay, and R. N. Downer.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix B, 1 fig, 19 p, 41 ref. OWRR C-2169 (No 3377) (1).

Descriptors: *Sedimentation, *Bibliographies, Deposition, Sediment load, Erosion, Urbanization, Environmental effects, *Connecticut River, *Diversion, *Inter-basin transfers.

It is evident from this literature survey that there is very little quantitative data on sedimentation in the Connecticut River basin. This is partly due to the fact that the Connecticut River bed is quite stable and has not experienced excessive sediment deposits. Also, although there has been rapid urbanization in localized areas within the basin, the general trend in the basin is toward reforestation and thus reduction in sediment production. The report recommends, however, that (1) certain special areas such as river bends and urbanizing tributaries should be studied; (2) that at least one sediment load station should be established on the main stem of the river; and (3) that where historic data is available on cross-sections and reservoirs these areas should be surveyed again and periodically in the future. Sediment transport data from four tributary streams are plotted on a graph. (See also W73-10726). (Elfers-North Carolina).
W73-10728

SHAPE AND NATURE OF SMALL SEDIMENTARY QUARTZ PARTICLES,
Queens Coll., Flushing, N.Y. Dept. of Earth and Environmental Sciences.
D. H. Krinsley, and I. J. Smalley.
Science, Vol 180, No 4092, p 1277-1279, June 22, 1973. 4 fig, 7 ref.

Descriptors: *Quartz, *Sediments, *Particle shape, *Particle size, *Petrofabrics, Sedimentology, Sedimentation, Sedimentary structures, Loess, Clays, Silts.

Small quartz particles in sediments are almost always shaped like flat plates. Also, they are almost invariably produced by breakage, attrition from larger particles. This suggests that a cleavage mechanism operates in quartz when the particle size is reduced below a critical value. This critical size may be on the order of 100 micrometers. This cleavage may occur on the (0001) planes (c planes). (Knapp-USGS)
W73-10742

SHELF SEDIMENT TRANSPORT: PROCESS AND PATTERN.
Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, D. J. P. Swift, et al, editors, 1972. 656 p.

Descriptors: *Sediment transport, *Ocean currents, *Continental shelf, *Currents (Water), *Waves (Water), Surf, Turbulence, Sedimentation, Sedimentology, Distribution patterns.

This volume contains papers presented in a symposium on shelf sediment transport conducted at the annual meeting of the Geological Society of America held in Washington, D.C., November 1971. Several papers not delivered at the symposium were added to broaden the scope. The three sections of the book are concerned with shelf hydraulic regime and mechanics of sediment transport, suspended sediment dispersal, and bottom sediment dispersal. The goal of assembling these papers was to document some fundamental aspects of the shelf milieux and its sediment dispersal systems, to indicate the nature and scope of present knowledge and the direction of ongoing research, and to provide some perspective on the problems associated with understanding, determining, and predicting sediment transport on continental shelves. (See also W73-10747 thru W73-10773) (Knapp-USGS)
W73-10746

AN INTRODUCTION TO OCEANIC WATER MOTIONS AND THEIR RELATION TO SEDIMENT TRANSPORT,
Army Coastal Engineering Research Center, Washington, D.C.
J. R. Weggel.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 1-20, 1972. 5 fig, 12 ref.

Descriptors: *Sediment transport, *Ocean currents, *Continental shelf, *Currents (Water),

*Waves (Water), Surf, Turbulence, Sedimentation, Sedimentology, Distribution patterns.

A brief discussion of those aspects of flow important in sedimentation studies is presented as an introduction to discussion of the physical principles governing fluid flows. Examples of how these principles manifest themselves in the oceans, the assumptions made in simplifying the governing equations, and in some cases how the flow is related to sediment movement, are presented. Wave motions, particularly wave-induced near-bottom velocities, are discussed with regard to their increasing ability to agitate bottom materials as waves move shoreward across the continental shelf. Ocean currents also provide a mechanism for transporting marine sediments. Examples of observed current phenomena and the assumptions made to simplify the governing equations are presented. The deflection of wind driven turbulent currents caused by Coriolis effects results in the well-known Ekman spiral. Ekman's result for deep water is given. The important implication for shelf sediment transport studies is that care must be exercised in extrapolating surface wind and current observations to the near-bottom currents that are important in moving sediments. (See also W73-10746) (Knapp-USGS)
W73-10747

WAVE BOUNDARY LAYERS AND THEIR RELATION TO SEDIMENT TRANSPORT,
Army Coastal Engineering Research Center, Washington, D.C.
P. G. Teleki.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 21-59, 1972. 15 fig, 81 ref.

Descriptors: *Sediment transport, *Continental shelf, *Surf, Waves (Water), Ocean waves, Ocean currents, Littoral drift, Erosion, Boundary layers, Turbulent flow, Turbulence, Unsteady flow, Sedimentation.
Identifiers: *Oscillating flow.

Sediment transport in the ocean is examined from the viewpoint of oscillating flows. Principles of both steady and unsteady boundary layers are reviewed. In the potential flow region the forcing function is represented by the combined effect of waves and currents. This paper is concerned mainly with the effects of waves. A unifying theory for energy dissipation and sediment transport under shoaling, breaking, and transformed waves does not exist because the nonlinearity present in wave motion and in turbulence has not been appraised. Study of the response function (sediment motion) can be conducted more efficiently through research on boundary layers in oscillating flows. Relationships for the distribution of velocity and shear stress in periodic flows are dependent on the characteristic frequency and amplitude of oscillation. Shear stress measurements show increasing magnitude shoreward, outside the zone of breaking waves. There is no adequate theory for the mechanics of energy dissipation and sediment motion in the region of shoaling, breaking, and broken waves. Consequently, the assumption of wave energy conservation up to wave breaking is open to reappraisal because it ignores the physical evidence presented by tracer experiments of sediment moving offshore of the breaker zone. (See also W73-10746) (Knapp-USGS)
W73-10748

PREDICTING INITIAL MOTION AND BEDLOAD TRANSPORT OF SEDIMENT PARTICLES IN THE SHALLOW MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
R. W. Sternberg.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 61-82, 1972. 26 fig, 1 tab, 25 ref. AEC AT-45-1-2225 TA 21-1, NSF GA 28964.

Descriptors: *Sediment transport, *Continental shelf, *Surf, Waves (Water), Ocean waves, Ocean currents, Littoral drift, Erosion, Boundary layers, Turbulent flow, Turbulence, Unsteady flow, Sedimentation.

Boundary-layer and sediment-transport measurements from the marine environment were used to develop a procedure for predicting grain movement for sand-sized particles over the sea floor. Given a knowledge of sediment texture and mean velocity one meter from the seabed it is possible to estimate the boundary-shear stress, predict the initiation of grain movement, and estimate the mass transport of sediment as bedload. The Bagnold bedload equations are used for the bedload transport predictions, modified to fit the results of oceanographic field experiments. The advantages of this procedure are its simplicity with respect to the independent variables (mean velocity and sediment size) and that every step in the technique was developed from field measurements; hence, it is specially suited for application in the marine environment. (See also W73-10746) (Knapp-USGS)
W73-10749

EXPERIMENTS ON BOTTOM SEDIMENT MOVEMENT BY BREAKING INTERNAL WAVES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
J. B. Southard, and D. A. Cacchione.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 83-97, 1972. 11 fig, 14 ref. ONR Contract N00014-67-A0204-0048.

Descriptors: *Internal waves, *Sediment transport, *Gravity waves, *Continental shelf, Thermocline, Interfaces, Waves (Water), Ocean waves, Thermal stratification, Hydraulic models, Model studies, *Bottom sediments.
Identifiers: Breaking internal waves.

Bottom-sediment movement produced by oceanic internal gravity waves as they shoal on the continental shelf or upper slope were studied over a planar sloping bottom mantled with lightweight acrylic sediment using a two-layer fluid medium in a large wave tank. The waves break abruptly as they shoal, producing a breaker in the form of a turbulent and rapidly dissipating vortex. There is a compensating return flow of mixed fluid along the bed between breakers. Sediment is moved upslope by the breakers, partly in suspension, and downslope by the return flow, as bedload. Predominant flow at the bed and therefore also net sediment transport are downslope. Sediment movement is strongest just upslope of the point of breaking and decreases to zero gradually upslope and sharply down slope. Sediment ripples form and migrate downslope toward the point of breaking despite disruption by each breaker. There is a broad band of slow net erosion upslope and a narrower band of more rapid net deposition near the point of breaking. (See also W73-10746) (Knapp-USGS)
W73-10750

WAVE ESTIMATES FOR COASTAL REGIONS,
Army Coastal Engineering Research Center, Washington, D.C.
D. L. Harris.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 99-125, 1972. 16 fig, 4 tab, 34 ref.

Descriptors: *Waves (Water), *Data collections, *Surf, *Coasts, *Continental shelf, Aerial photography, Instrumentation, Time series analysis, Frequency, Frequency analysis, Wavelengths, Weather.

Significant information about wave climate can be obtained from aerial photographs and instrument records, visual observations, and wave hindcasts based on weather charts. Estimates of wave-height data from all of these are reasonably well correlated. Observations of wave period are considerably less satisfactory. Aerial photographs and spectral analysis of instrument records indicate that two or more wave trains with distinct periods are generally present; however, visual observations and most manual analyses of instrument records give only one wave period for each observation. This is largely the result of a tendency by observers to assign a single value to the wave period even though several distinct periods are important. In addition, reported values of wave period from shipboard generally give little indication of the period experienced near the beach. This results both from masking of long period waves by short period seas, and from peaking up of long period waves in the breaker zone. (See also W73-10746) (Knapp-USGS)
W73-10751

OBSERVATIONS ON WIND, TIDAL, AND DENSITY-DRIVEN CURRENTS IN THE VICINITY OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 127-142, 1972. 8 fig, 1 tab, 13 ref. ONR-GP Contract N00014-69-A-0211-0003.

Descriptors: *Currents (Water), *Continental shelf, *Deltas, *Mississippi River, Winds, Water circulation, Density currents, Tides.
Identifiers: *Mississippi Delta.

Variation with depth of currents and water density were studied in 15 m of water east of the Mississippi River delta for 5 days in March 1970. After a tidal current was isolated and removed, the residual current data were closely correlated with winds and density gradients. Wind effects are of great importance to current structure on the shelf east of the Mississippi River delta. When wind speeds exceed about 20 knots from the southeasterly quadrant, currents driven directly by the wind, in combination with slope currents generated by wind setup against the coast, produce vertical circulation patterns with onshore flow in the surface waters and offshore flow in the bottom waters. Density structure and the redistribution of mass by winds can alter and even reverse the velocity field produced by the wind effects. After a southeasterly storm, strong south to southwesterly currents persist for several days, producing a relatively stable current. (See also W73-10746) (Knapp-USGS)
W73-10752

SEDIMENT TRANSPORT ON THE CONTINENTAL SHELF OFF OF WASHINGTON AND OREGON IN LIGHT OF RECENT CURRENT MEASUREMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
J. D. Smith, and T. S. Hopkins.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 143-180, 1972. 16 fig, 2 tab, 34 ref. AEC Contract AT (45-1)-2225-T25.

Descriptors: *Sediment transport, *Continental shelf, *Washington, *Currents (Water), Suspended load, Bed load, Storms, Current meters, Data collections, Sampling, Bottom sediments, Particle size, Oceanography.

Current measurements were made on the central and outer parts of continental shelves off Washington and Oregon. Emphasis was placed upon obtaining a time series of at least a two-year duration at a single location. Significant sediment

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transport occurs only during storms, and the near-bottom currents have a substantial offshore component. Suspended load transport of sediment is extremely important, whereas bedload transport of sediment is not. Although no completely satisfactory theory for suspended-sediment transport is available, estimates indicate that a typical winter storm with current speeds up to 60 cm per sec transports on the order of 6 cu m per hr per m of shelf length; a storm with speeds of up to 70 cm per sec transports about 15 cu m per hr per m off of the continental shelf and into deeper water. Such calculations suggest that a severe storm occurring every few years might have more geological significance than a number of less severe storms. (See also W73-10746) (Knapp-USGS)
W73-10753

IMPLICATIONS OF SEDIMENT DISPERSAL FROM LONG-TERM, BOTTOM-CURRENT MEASUREMENTS ON THE CONTINENTAL SHELF OF WASHINGTON,
Washington Univ., Seattle. Dept. of Oceanography.
R. W. Sternberg, and D. A. McManus.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 181-194, 1972. 7 fig, 3 tab, 10 ref. AEC Contracts AT (45-1)-1725 and AT (45-1)-2200.

Descriptors: *Sediment transport, *Continental shelf, *Washington, *Currents (Water), Suspended load, Bed load, Storms, Current meters, Data collections, Sampling, Bottom sediments, Particle size, Oceanography.

Current speed and direction data collected near the seabed of the Washington continental shelf were analyzed for magnitude and directional response. Histograms show the directional variability of the various speed classes. Data within speed classes were averaged over monthly and annual periods to determine the net direction of movement of bottom water. On the continental shelf of Washington, the bottom currents respond strongly to the surface wind stress. Currents of all speeds show a high degree of directional variability; however, all bottom currents greater than 10 cm per sec exhibit an overall trend to the northwest. Sediment movement frequently occurs on the central continental shelf during the winter months. Lateral sediment dispersal (across the shelf) should occur as a result of the high variability of current direction with a net northward displacement of sediment. The maximum annual displacement that could be experienced by a sedimentary particle under the observed conditions is estimated to be approximately 220 km to the northwest. (See also W73-10746) (Knapp-USGS)
W73-10754

SHELF SEDIMENT TRANSPORT: A PROBABILITY MODEL,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
D. J. P. Swift, J. C. Ludwick, and W. R. Boehmer.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 195-223, 1972. 8 fig, 5 tab, 33 ref.

Descriptors: *Sediment transport, *Continental shelf, *Markov processes, *Probability, *Statistical models, Sediment sorting, Sedimentation, Particle size, Distribution patterns.

For many purposes the most useful conceptual framework for the study of detrital sediments is that of the sediment transport system. A system is comprised of a sediment source and a dispersal zone which is at once a conduit and sink. Sediment transport systems impress granulometric and other petrographic gradients on their deposits by means of progressive sorting and similar mechanisms. Markov process modeling may be used for testing assumptions concerning sediment-transport systems. Transition probabilities are employed as operational substitutes for incompletely understood physical mechanisms. In particular, the granulometric evolution of a detrital sediment stream through a dispersal zone may be examined stage by stage. A simple, one-dimensional model consists of a Markov chain of nine transient states with nonzero transition probabilities between adjacent states only. Calculation of the limiting state probability distribution permits the further calculation of simulated sediment size frequency distributions across a hypothetical shelf. Progressive size sorting will occur in the model if the transport is over a depositional surface. If the input size distribution is not approximately normal, the distribution will evolve towards the normal configuration during the sorting process. In several variants of the model, standard deviation tends to decrease and kurtosis to increase. Skewness may increase, especially if the transport competence declines across the system. (See also W73-10746) (Knapp-USGS)
W73-10755

TRANSPORT AND ESCAPE OF FINE-GRAINED SEDIMENT FROM SHELF AREAS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
I. N. McCave.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 225-248, 1972. 6 fig, 1 tab, 97 ref.

Descriptors: *Sediment transport, *Continental shelf, *Mud, Currents (Water), Density currents, Turbidity currents, Bottom sediments, Bed load, Suspended load, Diffusion, Dispersion, Erosion, Ocean currents, Littoral drift.

Waves and tidal currents contribute to a process of diffusive transport of sediment across the continental shelf. Critical erosion friction velocities for cohesive sediment are related to yield strength. Deposition is controlled by the nearbed concentration, settling velocity, and a limiting shear stress above which no sediment is deposited. Critical erosion shear stresses greater than limiting stress are required after only a few hours compaction of a freshly deposited bed. Thus deposits formed nearshore from high-concentration flows during calm weather may develop sufficient cohesive strength to withstand storm conditions. Mid-shelf mud belts arise from diffusive transport across the shelf to deposition sites where wave and tidal activity are relatively lower than on the inner or outer shelf. Outer-shelf and blanket mud deposits are caused by higher than average concentrations occurring under advective mud streams. Most suspended sediment escaping from shelves must be deposited on the slope and rise. Of this the greater part must be in cones and fans off the major input points. As the concentrations are very low, settling does not give the required rates of deposition, thus high-level escape of sediment is precluded, and escape from shelves must be mainly along the bottom. Possible transport mechanisms are cascading of cold water off the shelf in winter, water movement down submarine canyons, bottom Ekman layer transport downslope under major ocean boundary currents, and low-concentration turbidity currents. (See also W73-10746) (Knapp-USGS)
W73-10756

SOURCES AND SINKS OF SUSPENDED MATTER ON CONTINENTAL SHELVES,
Geological Survey, Woods Hole, Mass.
R. H. Meade.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 249-262, 1972. 51 ref.

Descriptors: *Continental shelf, *Suspended load, *Provenance, *Sedimentation, Aquatic life, Bottom sediment, Dispersion, Sediment transport.
Identifiers: *Sediment sources.

While river sediments are the principal sources of suspended matter on many continental shelves, their importance on the Atlantic Continental shelf of the United States is less than that of biogenic detritus produced by shelf organisms and of material resuspended from the shelf bottom. The major sites of accumulation of suspended matter from the Atlantic shelf are in the large estuaries and coastal marshlands rather than on the shelf itself or in the deep sea. Sources other than river sediments and sinks other than the sea floor should be given ample consideration in assessing the dispersal of suspended sediments on other continental margins of the world. (See also W73-10746) (Knapp-USGS)
W73-10757

SUSPENDED SEDIMENTS IN CONTINENTAL SHELF WATERS OFF CAPE HATTERAS, NORTH CAROLINA,
Illinois Univ., Chicago. Dept. of Geology.
B. A. Buss, and K. S. Rodolfo.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 263-279, 1972. 8 fig, 22 ref. NSF Grants GA-1072 and GA-12783.

Descriptors: *Suspended load, *Continental shelf, *Salinity, *Currents (Water), *Ocean currents, Waves (Water), Mixing, Bottom sediments, Water temperature, Remote sensing, Littoral drift.
Identifiers: *Cape Hatteras.

Suspended sediment and salinity samples were taken at 46 stations over the Cape Hatteras shelf area August 26-28, 1970 to provide field data on the Cape Hatteras plume seen in Apollo 9 photographs. Relatively high levels of suspensate (more than 2 mg per liter) and waters of low salinity from Pamlico Sound issue onto the shelf through Okracoke and Hatteras Inlets. A portion of this outflow is moved southward by coastal currents. In the shoal waters off the cape, mixing by waves and currents causes suspensions of between 0.5 and 1.0 mg per liter. Seaward, suspensions are gradually diluted to less than 0.10 mg per liter on the outer shelf and slope. (See also W73-10746) (Knapp-USGS)
W73-10758

MINERALOGY OF SUSPENDED SEDIMENT OFF THE SOUTHEASTERN UNITED STATES,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
J. W. Pierce, D. D. Nelson, and D. J. Colquhoun.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 281-305, 1972. 8 fig, 5 tab, 39 ref. NSF Grants GB17545 and GA27725.

Descriptors: *Suspended load, *Continental shelf, *Mineralogy, *Provenance, Sampling, Currents (Water), Rivers, Distribution patterns, Ocean currents, Atlantic Ocean, Southeast U.S.

On the continental shelf from Chesapeake Bay to Savannah, Georgia, four water masses were found with distinct mineral suites suspended in the water. The mineralogy associated with each watermass reflects the contribution of continental sediment from the area where the watermasses originate. Minerals suspended in Carolinian coastal water apparently are the result of river runoff in the Carolinas and Georgia. The suite in the Virginian coastal water has northern affinities and probably originates north of Chesapeake Bay. Gulf stream and Carolinian slope water also have diagnostic suites. Mineralogy can be used to identify watermasses in the way that temperature and salinity have been used. (See also W73-10746) (Knapp-USGS)
W73-10759

SEDIMENT TRANSPORT ON THE SANTA BARBARA-OXNARD SHELF, SANTA BARBARA CHANNEL, CALIFORNIA,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
D. E. Drake, R. L. Kolpack, and P. J. Fischer.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 307-331, 1972. 18 fig, 2 tab, 20 ref.

Descriptors: *Sediment transport, *Continental shelf, *Floods, *California, Turbidity currents, Thermal stratification, Density currents, Littoral drift, Ocean currents, Waves (Water), Currents (Water).

The floods of January and February 1969 in California caused a record discharge of sediment into the waters over the Santa Barbara-Oxnard Shelf. Following the floods, suspended sediment concentrations were highest over the inner shelf and exhibited an approximately exponential decrease across the shelf at all water depths. Concentrations were generally highest near the bottom and ranged from approximately 50 mg per liter over the inner shelf during the floods to less than 1.0 mg per liter at the shelf break late in 1969 and early in 1970. Redistribution of the flood sediment involved rapid erosion over the inner shelf and transfer of this material to the middle and outer shelf occurred within protected topographic depressions and in response to the seaward decline in current energies. Seaward transport of material occurred within a northwestward and westward flowing geostrophic current and within a current convergence trending across the shelf from Ventura. Transport of suspended particles across the shelf in the presence of thermal stratification within the water column resulted in detachment of turbid water from the near-bottom nepheloid layer. (See also W73-10746) (Knapp-USGS)
W73-10760

COMMENTS ON THE DISPERSAL OF SUSPENDED SEDIMENT ACROSS THE CONTINENTAL SHELVES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel, and A. Okubo.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 333-346, 1972. 7 fig, 14 ref. NSF Grants GA 28276 and GA 16603.

Descriptors: *Sediment transport, *Continental shelf, *Suspended load, *Dispersion, *Distribution patterns, Sedimentation, Deposition (Sediments), Surf, Silts, Estuaries, Rivers, Mathematical models, Littoral drift, Ocean currents, Currents (Water).

Most fine-grained inorganic deep-sea sediment is derived from the continents and crossed the continental shelves to reach the ocean basins. Most of it crossed the shelves in suspension, but the routes and rates of transport are obscure. Most of the sediment now being discharged by rivers is trapped in estuaries, but nearly all that escapes crosses the shelf. A simple steady-state, two-dimensional mathematical model applied off the mouth of Chesapeake Bay supports the idea of bypassing of the shelf by fine-grained terrigenous sediment, and suggests that much of the fine-grained sediment that escapes the estuaries may be accumulating on the continental slope and rise. The cross-shelf flux of sediment associated with the mean (residual) flow can account for most of the sediment that reaches the ocean basins. (See also W73-10746) (Knapp-USGS)
W73-10761

SOME SPECIFIC PROBLEMS IN UNDERSTANDING BOTTOM SEDIMENT DISTRIBUTION AND DISPERSAL ON THE CONTINENTAL SHELF,
Washington Univ., Seattle. Dept. of Oceanography.
J. S. Creager, and R. W. Sternberg.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 347-362, 1972. 3 fig, 1 tab, 34 ref.

Descriptors: *Sediment transport, *Continental shelf, *Suspended load, *Dispersion, *Distribution patterns, Sedimentation, Deposition (Sediments), Surf, Silts, Estuaries, Rivers, Mathematical models, Littoral drift, Ocean currents, Currents (Water), *Bottom sediments.

Research into the problems of continental-shelf-sediment classification, distribution, and dispersal mechanisms should not be a simplistic study of sediment distribution alone. The dispersal mechanisms which have sometimes been intuitively deduced must be observed and measured. Study of the processes rather than the results must be an immediate goal. An example is presented to point out how intuition has led to a general misunderstanding of the sediment types present on Arctic continental shelves. This has led to a second-order misinterpretation of dispersal mechanisms deduced from the generality that Arctic continental shelves are covered by glacial sediment. A second example is given of the problems encountered in attempting to apply a wave-surge dominated, shelf sediment dispersal model to the Washington continental shelf. (See also W73-10746) (Knapp-USGS)
W73-10762

IMPLICATIONS OF SEDIMENT DISPERSAL FROM BOTTOM CURRENT MEASUREMENTS; SOME SPECIFIC PROBLEMS IN UNDERSTANDING BOTTOM SEDIMENT DISTRIBUTION AND DISPERSAL ON THE CONTINENTAL SHELF--A DISCUSSION OF TWO PAPERS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
D. J. P. Swift.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 363-371, 1972. 1 fig, 23 ref.

Descriptors: *Sediment transport, *Continental shelf, *Suspended load, *Dispersion, *Distribution patterns, Sedimentation, Deposition (Sediments), Surf, Silts, Estuaries, Rivers, Mathematical models, Littoral drift, Ocean currents, Currents (Water).

The wind-drift component of shelf storm currents is a major, if not dominant, cause of unidirectional currents over large portions of most nontidal shelves. The current velocity field over the shelf is complex. In storm-generated bottom currents a unidirectional component of compound origin is dominant, and the surge-dominated flow is characterized but not confined to the fair-weather hydraulic regime. Shelf currents are frequently of compound origin. Such an approach to study of sediments may encourage examination of the role of waves as a contributing factor in shelf sediment transport. A simple random walk model for sediment transport across the shelf does not accurately describe the advective component of sediment transport. It does, however, accommodate the diffusive component. The more flexible Markov-process model is valid for both components. (See also W73-10746) (Knapp-USGS)
W73-10763

SEDIMENT TRANSPORT AROUND THE BRITISH ISLES,
National Inst. of Oceanography, Wormley (England).
A. H. Stride.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 373-375, 1972. 10 ref.

Descriptors: *Sediment transport, *Continental shelf, *Sedimentation, *Distribution patterns, *Sedimentary structures, Tides, Waves (Water), Currents (Water), Water circulation, Ocean currents.
Identifiers: *British Isles.

The sea floor around the British Isles is a good region for studying sedimentation processes. The strong currents occurring in some regions produce a suite of characteristic bed forms. There are extensive areas of floor at most depths down to about 200 m, with enclosed seas, narrow straits, and long open reaches of ocean-facing continental shelf. Some floors were heavily glaciated while others lay beyond the ice sheets. The main currents are tidal, with strength near the sea surface reaching between one half and 4 knots over large areas; other currents are intermittent, more variable in direction and generally weak. The known bed forms include longitudinal furrows and gravel waves, sand ribbons, and sand waves. The direction of net transport of sand and gravel seems to be determined by the peak tidal current asymmetry, while storm waves can increase the transport more than twentyfold in winter. There are extensive sheetlike deposits of gravel, sand, and silt where grade is in equilibrium with current strength. Sand deposits being laid on a gravel floor can be represented by isolated patches when sand is in short supply. Elsewhere, there are isolated deposits of sand tied to estuaries, bays, headlands, straits, and to the edge of the continental shelf. (See also W73-10746) (Knapp-USGS)
W73-10764

MIGRATION OF TIDAL SAND WAVES IN CHESAPEAKE BAY ENTRANCE,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
J. C. Ludwick.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 377-410, 1972. 10 fig, 2 tab, 62 ref.

Descriptors: *Sand waves, *Chesapeake Bay, *Continental shelf, *Shoals, *Sediment transport, Sedimentary structures, Sedimentation, Tides, Water circulation, Estuaries, Currents (Water), Sand bars.

Subtidal sand waves occur atop shoals and on shoal margins in the northern part of the tidal entrance to Chesapeake Bay, Virginia. Wavelength ranges from 60 to 245 m; height ranges from 1.5 to 3.4 m. All major slopes are 2 to 3 deg, far less than the angle of repose. In flood-dominated tidal channels, sand waves are asymmetrical and face landwards; in ebb-dominated tidal channels and atop most banks, sand waves face seawards. Where near-bottom flood and ebb tidal currents are equal in time-velocity impulse, sand waves of symmetrical-trochoidal profile are developed. The seaward-facing asymmetrical sand waves are migrating seaward at 35 to 150 m per yr. Sand wave height changes seasonally; small heights occur from October to late April when surface water waves are frequently higher than 1.5 m; large sand wave heights occur from May to September, particularly during the latter month when surface water waves are usually lower than 1.5 m in height. Prominant shoals in the entrance area characteristically have ebb-dominated near-bottom tidal currents on one side and flood-dominated near-bottom tidal currents on the other side. This pattern is suggestive of a sand circulation conjoint with the shoal. (See also W73-10746) (Knapp-USGS)
W73-10765

WATER CIRCULATION AND SEDIMENTATION AT ESTUARY ENTRANCES ON THE GEORGIA COAST,
Skidaway Inst. of Oceanography, Savannah, Ga.
G. F. Oertel, II, and J. D. Howard.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 411-427, 1972. 12 fig, 31 ref. USCE Contract DACW 72-68-C-0030, NSF Grant GA-30565.

Descriptors: *Sedimentation, *Coastal plains, *Shoals, *Georgia, *Estuaries, Water circulation, Currents (Water), Tides, Waves, Littoral drift, Aggradation, Sediment transport, Distribution patterns.

Estuary entrance-shoals extend seaward of all major entrances of the Georgia coast. Orientations and morphologies of these shoals are in response to (a) transient coastal currents controlled by seasonal winds, (b) relationships of ebb jets to coastal currents, and (c) hydraulic pressure gradients at entrances. Northeasterly winds create high-energy swells which result in southward diversion of longshore drift and aggradation of shoals on the north sides of inlets. These shoals are detached from the shoreline and are generally breached in several places by small tidal channels. Attached shoals on the south sides of inlets are starved during these periods. Southerly onshore winds result in currents which cause seaward prograding of shoals on the south sides of inlets. At the same time, sediment cells and gyres trap sediment on shoals on the north sides of inlets and accretion is multidirectional. (See also W73-10746) (Knapp-USGS)
W73-10766

ONSHORE TRANSPORTATION OF CONTINENTAL SHELF SEDIMENT: ATLANTIC SOUTHEASTERN UNITED STATES,
Duke Univ., Durham, N.C. Dept. of Geology; and Duke Univ., Beaufort, N.C. Marine Lab.
O. H. Pilkey, and M. E. Field.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 429-446, 1972. 6 fig, 1 tab, 35 ref.

Descriptors: *Sediment transport, *Provenance, *Continental shelf, *Beaches, Coasts, Mineralogy, Sands, Surf, Water level fluctuations, Distribution patterns.

Beach and estuarine sands on the southeastern United States Atlantic coast are derived in part from the adjacent continental shelf. Anomalies in abundances of phosphorite grains, in total gold content, in ooids, and in various heavy minerals (in particular, epidote, staurolite, and garnet) on the shelf show a close correspondence to anomalies in adjacent shoreline and near-shore environments. Carbonate content and textures of beach and shelf deposits show a correlation between the two environments on a regional scale. Oolitic grains in central Florida beach sands and phosphorite grains on North Carolina beaches originate exclusively from continental shelf sources lying appreciable distances (up to 20 km) offshore, thus demonstrating onshore transportation in these cases. The presence of easily abraded, shelf-derived oolite grains in quartz beach sands is evidence of onshore transportation occurring at present. Some of the inferred movement of sediment may have occurred actually by the simple process of landward migration of the surf wedge or shoreface during the last rise in sea level rather than by present-day processes. Possible mechanisms of present-day movement include asymmetry of shoaling waves and tidal and storm-induced currents. (See also W73-10746) (Knapp-USGS)
W73-10767

LINEAR SHOALS ON THE ATLANTIC INNER CONTINENTAL SHELF, FLORIDA TO LONG ISLAND,
Army Coastal Engineering Research Center, Washington, D.C.
D. B. Duane, M. E. Field, E. P. Meisburger, D. J. P. Swift, and S. J. Williams.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 447-498, 1972. 22 fig, 1 tab, 69 ref.

Descriptors: *Sedimentation, *Coastal plains, *Shoals, Sand bars, Aggradation, Sediment transport, Sands, Coasts, Sand spits, Estuaries, Distribution patterns.

The inner Atlantic continental shelf from Long Island to Florida is characterized by fields of linear, northeast trending shoals. The shoals have up to 30 ft of relief, have side slopes of a few degrees and extend for tens of miles. Clusters of linear shoals merge with the shoreface in water as shallow as 10 ft. These inner-shelf sand bodies or shoals can be grouped as arcuate (inlet and cape-associated) and linear. Linear shoals may radiate from estuary mouths, as a second order structure on arcuate, inlet-associated shoals, or may occur on the open coast. Linear shoals on the open coast may be shoreface-connected or isolated. All linear shoals of the open coast form a small angle with the coast line; most open northward regardless of presumed direction of net littoral drift. The cape-associated shoals are plano-convex features resting upon a featureless, nearly horizontal stratum. Formation of shoals post-dated the last transgression; hence they are all younger than at least 11,000 BP. Changes in mineralogy of the shoals parallel changes in the mineralogy of adjacent beaches. Shoreface-connected shoals have granulometric characteristics similar to the beach. Shoreface-connected shoals appear to be forming in response to the interaction of south-trending, shore-parallel, wind setup currents with wave-generated bottom currents during winter storms. The helical flow that they induce in coast-parallel storm currents causes aggradation of their crests and fair-weather wave surge degrades them. Equilibrium shoal crest depth is about 30 ft on the inner shelf. A second mode of crest depth at 50 ft may reflect a recent stillstand at that level. (See also W73-10746) (Knapp-USGS)
W73-10768

HOLOCENE EVOLUTION OF THE SHELF SURFACE, CENTRAL AND SOUTHERN ATLANTIC SHELF OF NORTH AMERICA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
D. J. P. Swift, J. W. Kofoed, F. P. Saulsbury, and P. Sears.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 499-574, 1972. 41 fig, 3 tab, 109 ref.

Descriptors: *Sedimentation, *Erosion, *Geomorphology, *Continental shelf, *Sediment transport, Beaches, Sedimentary structures, Shoals, Sand bars, Sand waves, Sand spits, Recent epoch, Pleistocene epoch, Distribution patterns.

The floor of the central and southern Atlantic shelf shows relict geomorphic features. An initial pattern is an erosional one consisting of major transverse shelf valleys and plateaulike interfluves. The dominant modern pattern is that of constructional topography formed at the foot of the shoreface. This constructional pattern is undergoing further modification in response to the modern hydraulic regime. A rise in sea level over an unconsolidated coast results in shore-face erosion, equivalent to parallel slope retreat, and a concomitant aggradation of the adjacent sea floor. The resulting discontinuous debris mantle, the Holocene transgressive sand sheet, is only partly autochthonous with respect to the Holocene sedimentary cycle, since it incorporates Holocene fluvial deposits. The surface of this sand sheet has been molded into a variety of morphologic elements. Where the sheet has been generated directly from the retreating shoreface, a ridge-and-swale topography has been empressed upon it. Off cuspate forelands, the convergence of littoral drift has resulted in cape-associated shoals. Off estuary mouths the intersection of littoral drift with the reversing estuary tide has created inlet-associated shoals. Shelf-transverse sand bodies, formed by the progressive landward displacement of shoreline deposition centers, are shoal-retreat massifs. The ridge-and-swale topography is a stable end-configuration toward which a variety of depositional and erosional topographies tend to converse. Southward sediment transport in the Middle Atlantic bight intensifies toward shore and toward the south, as far as Florida. (See also W73-10746) (Knapp-USGS)
W73-10769

SEDIMENT TEXTURAL PATTERNS ON SAN PEDRO SHELF, CALIFORNIA (1951-1971): REWORKING AND TRANSPORT BY WAVES AND CURRENTS,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
D. S. Gorsline, and D. J. Grant.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 575-600, 1972. 15 fig, 2 tab, 40 ref.

Descriptors: *Sediment transport, *Particle size, *California, *Continential shelf, Sediment sorting, Littoral drift, Ocean currents, Currents (Water), Sedimentation, Tides, Waves (Water), Sedimentology, Distribution patterns.

Trend surfaces of sediment-size parameters of the San Pedro Shelf, California, calculated as moment measures show patterns that can be related to long wave and local current regimes. The shelf, off Los Angeles, is located in a region of intermediate wave energy, but is screened by offshore islands from most of the open ocean waves from the Pacific except for limited westerly and southerly approaches. Currents are tidal, wind-driven, and wave-generated long-shore drift from both south and west. An outer central zone of 20-40 m depth is probably affected by westerly and southerly long-period storm-wave convergence and prevailing wind-driven currents; a central area of outcropping Miocene rocks and relict sediments is being modified texturally by fine sediment drifted from the west; a southeastern coastal zone is dominated by north-flowing long-shore drift alongshore and by tidal exchange moving east from Los Angeles-Long Beach Harbor. Comparison of recent (1969-1970) data with earlier work (1951) shows some differences that suggest that the surficial sediments of the entire shelf surface are subject to change in a period of a couple of decades. Changes include both intrusion of fine sediments into a stable coarse sediment and active drift of fine sands in depths of 20-40 m. Some modification may extend to depths of as much as 100 m. (See also W73-10746) (Knapp-USGS)
W73-10770

OBSERVATIONS AND SIGNIFICANCE OF DEEP-WATER OSCILLATORY RIPPLE MARKS ON THE OREGON CONTINENTAL SHELF,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar, R. H. Neudeck, and L. D. Kulm.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 601-619, 1972. 8 fig, 3 tab, 23 ref. USGS Contracts 14-08-001-10766, -1194, and -12187.

Descriptors: *Sediment transport, *Continental shelf, *Oregon, *Ripple marks, *Waves (Water), Currents (Water), Storms, Sedimentary structures, Sand waves, Ocean currents, Littoral drift.

Symmetrical oscillatory ripple marks are found across the entire Oregon continental shelf out to water depths as great as 204 m. The ripples are principally of the trochoidal type, the crests trending north-south, parallel to the coast. Asymmetrical ripples are rare. Using Airy wave theory, bottom orbital velocities were calculated for average waves and storm waves. Velocities are sufficient to produce ripples out to depths of 100 m with occasional rippling to 200 m. Systematic variations in ripple length could be produced by a pattern of dispersed wave periods arriving from a distance-storm source. Besides producing ripples, the surface waves appear to be important in stirring and reworking the shelf sediments. Sediment transport on the shelf was examined with the Bagnold model in which the waves provide the power to place the bottom sediments in motion and a superimposed unidirectional current produces a net sediment drift. It is concluded that the effects of surface waves, as well as unidirectional currents, must be included in estimates of sediment transport on the continental shelf. (See also W73-10746) (Knapp-USGS)
W73-10771

CURRENTS AND SEDIMENT TRANSPORT AT THE WILMINGTON CANYON SHELFBREAK, AS OBSERVED BY UNDERWATER TELEVISION,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
D. J. Stanley, P. Fenner, and G. Kelling.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 621-644, 1972. 6 fig, 1 tab, 37 ref.

Descriptors: *Sediment transport, *Continental shelf, *Remote sensing, *Instrumentation, *Photography, Currents (Water), Tides, Waves (Water), Suspended load, Bed load.
Identifiers: *Television (Underwater).

An underwater television survey was made of the outer shelf, shelfbreak, and upper slope in the vicinity of Wilmington Canyon, about 175 km southeast of Delaware Bay and the Middle Atlantic States. It provides direct evidence of active currents and sediment transport at 26 stations, in water depths ranging from about 65 to 430 m. The 22 hr of videotape recorded for this study covered an area of about 400 sq km. The system allows documentation of current activity and the movement of sand and silt from the outer shelf to deeper environments seaward of the shelfbreak. Although the survey was made during a very calm period with low sea states, bottom currents competent to move sediment on the sea floor were observed throughout most of the survey area. Large amounts of suspended fine-grained material were observed in the near-bottom water and probably were scoured from the sea floor by these bottom currents and subsequently transported by movement of water masses in the vicinity of the shelfbreak. The regional current net in Wilmington Canyon shows a varied directional pattern of flow, presumably influenced by tides. Recorded velocities of up to 20 cm per sec are of sufficient intensity to move fine sand and silt along the bottom and eventually off the shelf to the adjacent slope and canyon. (See also W73-10746) (Knapp-USGS)
W73-10772

NEARSHORE SEDIMENTARY PROCESSES AS GEOLOGIC STUDIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
J. D. Howard.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 645-648, 1972.

Descriptors: *Sedimentology, *Continental shelf, *Sediment transport, *Stratigraphy, *Distribution patterns, Currents (Water), Waves (Water).

Studies of nearshore sedimentary environments and their processes can be improved if those studying the modern and those investigating the ancient have a point of common interest. A definite possibility for this exists in the study of physical and biogenic sedimentary structures which represent the responses to processes. If an offshore-to-beach sequence the spectrum of energy changes in a predictable way even though the energy maxima vary. As the energy varies, so do the processes, and responses to processes, which determine the preservable facies characteristics. In such studies the Uniformitarian Principle is an obvious and necessary tool. Equally important is the opportunity to utilize the ancient as a key to understanding and predicting present-day processes. (See also W73-10746) (Knapp-USGS)
W73-10773

DYNAMICS OF SILICON IN THE BLACK SEA AS OBSERVED ALONG THE CAPE KHERSONES-BOSPORUS PROFILE (DINAMIKA KREMNIYA V CHERNOM MORE PO MATERIALAM NABLYUDENIY NA RAZREZEMYS KHERSONES--PROLIV BOSFOR),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
For primary bibliographic entry see Field 02K.
W73-10780

ORGANIC MATTER IN THE EASTERN SIVASH (ORGANICHESKOYE VESHCHESTVO V VOSTOCHNOM SIVASHE),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
For primary bibliographic entry see Field 02K.
W73-10783

TRACE METALS IN CORES FROM THE GREAT MARSH, LEWES, DELAWARE.
Delaware Univ., Newark. Dept. of Geology.
R. N. Strom, and R. B. Biggs.
Available from NTIS Springfield, Va 22151 as COM-73-10206, Price $3.00 printed copy; $0.95 microfiche. College of Marine Studies Report DEL-SG-12-72, December 1972. 35 p, 12 fig, 7 ref, 2 append. NOAA Sea Grant 2-35223.

Descriptors: *Trace elements, *Sediments, *Coastal marshes, *Delaware, *Metals, Cores, Chemical analysis, Geochemistry, Salt marshes, Sedimentology, Correlation analysis, Depth, Zinc, Copper, Chromium, Iron, Lead, Cadmium.
Identifiers: *Great Marsh (Del).

Four 12-foot sediment cores and one 18-foot core were taken in the Great Marsh (Broadkill Marsh) near Lewes, Delaware, for the purpose of analyzing the areal and vertical changes in trace metal concentration in sediments deposited prior to the industrialization of the Delaware Bay watershed. The sediments are of marginal marine origin of brackish or saltwater conditions. The sediments of the Great Marsh were deposited during the Holocene marine transgression and deposition is apparently continuing unabated today. Lagoonal muds underlie the more recently formed salt-marsh materials. Beginning at 2 feet below land surface, samples were analyzed at 2-foot intervals for zinc, copper, chromium, iron, lead and cadmium. The levels of lead and cadmium were below the level of detectability (i.e. less than 1 ppm in the sediment sample). Zinc showed a slight increase in average concentration with increasing depth. Copper and cadmium showed no significant changes with depth. There appears to be no significant difference in the metal concentrations between the <63 micron and >63 micron fractions. (Woodard-USGS)
W73-10971

FIELD EXPERIMENTS ON FREEZING AND THAWING AT 3.350 METERS IN THE ROCKY MOUNTAINS OF COLORADO, U.S.A.,
Universidad Nacional del Sur, Bahia Blanca (Argentina).
For primary bibliographic entry see Field 02C.
W73-10976

PRELIMINARY OBSERVATIONS ON DOWNSLOPE MOVEMENT OF SOIL DURING THE FALL IN THE CHINOOK BELT OF ALBERTA,
S. A. Harris.
In: Research Methods in Pleistocene Geomorphology; Proceedings of 2nd Symposium of Geomorphology, Summer 1971, Guelph, Ontario, Canada: Guelph University Publication, p 275-285, 1972. 5 fig, 8 ref.

Descriptors: *Mass wasting, *Alpine, *Canada, *Creep, Solifluction, Degradation (Slope), Snowmelt, Soil moisture, On-site data collections.
Identifiers: Kananaskis Valley (Alberta).

The main process operating on the slopes at Kananaskis, Alberta, during fall and winter is surface creep. This movement is the result of several processes producing similar effects under different conditions. The end product is a steady downslope movement of the upper sheet of soil and unconsolidated material. The movement is such that on a slope of 34 deg under a bearberry-rose association, the movement downslope amounts to over 130 mm between October and March. No runoff was observed. Accordingly, water erosion has been absent during the fall 1970 and winter 1970-71. Soil creep is the major element in movement of material. Solifluction and mudflows were not observed. Frost boils were observed on scree and on bearberry covered slopes of up to 20 deg. Snow creep occurred at the two sites where the snow was deepest. (Knapp-USGS)
W73-10977

DATING CAVE CALCITE DEPOSITS BY THE URANIUM DISEQUILIBRIUM METHOD: SOME PRELIMINARY RESULTS FROM CROWSNEST PASS, ALBERTA,
McMaster Univ., Hamilton (Ontario).
D. C. Ford, P. Thompson, and H. P. Schwarcz.
In: Research Methods in Pleistocene Geomorphology; Proceedings of 2nd Symposium on Geomorphology, Summer 1971, Guelph, Ontario, Canada: Guelph University Publication, p 247-255, 1972. 2 fig, 1 tab, 13 ref.

Descriptors: *Karst, *Radioactive dating, *Calcite, *Uranium radioisotopes, *Glaciation, Erosion, Scour, Pleistocene epoch, Topography, Geomorphology, *Canada.

Uranium trapped within a calcite deposit is a potential clock, recording the time elapsed since precipitation by measurable radioactive decay. Specimens of ancient or recent calcite were taken from eight caves in the Canadian Rockies and the modern uranium ion concentrations were measured in underground stream and percolation waters. The calcite specimens were deposited in phreatic cave sites which were air-filled when net deposition began. Dating and hydrogeological interpretation of the dates suggest that at least 2,600 feet (or 63%) of the present relief existed 275,000 years ago; 90% of the relief existed at 200,000 years B.P., before the onset of the penultimate glacial. Since that time the valleys have been lowered by no more than 400 feet. The mean rate of lowering for the past 200,000 years is 2 feet per thousand years or somehat less. (Knapp-USGS)
W73-10978

BIOTURBATION RATES AND EFFECTS IN CARBONATE SAND, ST. JOHN, U.S. VIRGIN ISLAND,
Geological Survey, Menlo Park, Calif.
H. E. Clifton, and R. E. Hunter.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Journal of Geology, Vol 81, No 3, p 253-268, May 1973. 9 fig, 1 tab, 43 ref.

Descriptors: *Bottom sediments, *Carbonates, *Benthos, *Aquatic animals, Sedimentary structures, Benthic fauna, Marine animals, Sands.
Identifiers: *Bioturbation, *Carbonate sands.

Bioturbational rates and effects were studied in carbonate sand at depths from about 10 to 20 m near a coral reef. Inactive sand ripples are totally destroyed in 2-4 weeks. Lamination in the upper 2 cm is largely obliterated in the same amount of time. Pebbles on the sea floor can be buried in a few days by faunal undermining. The rate and style of bioturbation are strongly controlled by grain size of the substrate. Surface modification and pebble burial are most rapid in relatively fine sand, whereas the rate of shallow internal disruption of the sediment may be more rapid in coarser sand. Bioturbation in this environment results largely from activity during daylight hours. A large amount of sediment can be moved vertically or laterally by such activity. (Knapp-USGS)
W73-10984

ACCELERATED MOTION OF A SPHEROID IN VISCOUS FLUID,
Wisconsin Univ., Milwaukee. Dept. of Energetics.
R. Y. S. Lai.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9809, p 939-957, June 1973. 8 fig, 12 ref, append.

Descriptors: *Settling velocity, *Particle shape, Mathematical studies, Sedimentation, Drag, Stokes law, Sedimentology.

The equation of motion of a spheroid accelerated along its axis of symmetry by an arbitrarily applied force in a viscous fluid is solved exactly. The solutions are presented in terms of tabulated functions. The unsteady drag predicted by the Stokes-flow solution was used in the analysis. Both prolate and oblate spheroids are considered. The results are reduced to those of the case of an accelerated sphere. A prolate spheroid with a ratio of major axis to minor axis equal to 1.96 has the greatest terminal settling velocity among spheroids of equal volume. The variations of velocity and displacement with time for some spheroids falling from rest are presented in graphs. (Knapp-USGS)
W73-10989

AT-STREAM-VELOCITY PUMPING SEDIMENT SAMPLING SYSTEM,
Geological Survey, Fort Collins, Colo.
J. P. Bennett.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9801, p 873-887, June 1973. 9 fig, 7 ref, append.

Descriptors: *Sampling, *Suspended load, *Sedimentology, Equipment, Instrumentation, Velocity, Open channel flow, Stream gages, Sediment transport, Streamflow, Water quality, Sediment load.

A sampling system collects water-sediment samples at local stream velocity from any point in an open-channel flow. The system uses a flow-through Pitot tube as a combination velocity sensor and sampler nozzle. A sample of any desired volume can be collected without changing the position of the sampler nozzle. To compare the performance of the system with that of other samplers, suspended-sediment samples were collected from a flat-bed flow using the system, a US DH-48 sampler modified for point sampling, and siphon sampler. On the basis of these samples, at the 99% confidence level, the relative percent difference between the concentrations of the samples from the system and the siphon sampler was between -5.45 and 4.45 and the relative percent difference between the concentrations of the samples from the system and from the US DH-48 was between -.54 and 7.78. (Knapp-USGS)
W73-10992

THE EFFECT OF SILTING ON FLOW PROFILE UPSTREAM OF WEIRS--A CASE STUDY,
For primary bibliographic entry see Field 08B.
W73-10994

SEDIMENTATION STUDIES OF BHAKRA RESERVOIR,
A. N. Malhotra, and R. N. Hoon.
Irrigation and Power (India), Vol 28, No 1, p 37-52, January 1971. 7 fig, 9 tab, 3 append.

Descriptors: *Sedimentation, *Reservoir silting, *Sedimentation rates, *Sediment control, Forest management, Land management, Land development, Construction, Check structures, Erosion control, Dams, Reservoir stages, Sediment transport.
Identifiers: *India (Bhakra Reservoir).

The Bhakra Dam in India was completed in October 1963 and has since changed the entire economy of the area it serves. The devastating floods have been controlled and benefits to irrigation and power have brought prosperity to the area. The direct and indirect benefits of the dam depend on the storage capacity of its reservoir. This has a designed live storage of 7434.23 million cubic meters and a dead storage of 2431.22 million cubic meters. Silt inflow into the reservoir affects the life of the dam. In an endeavor to correctly assess the life of the dam and to explore means to prolong it if possible, the catchment conditions have been studied and results of the capacity surveys, suspended silt measurements, analyzed. The present rate of sedimentation is somewhat higher than assumed. This is chiefly due to the catchment area being poorly vegetated and disturbance of the soil by large scale development in the catchment area. The sedimentation has shown signs of reduction in the past few years. Remedies such as afforestation and check dams have been suggested to decrease the sedimentation rate and increase the life of the reservoir. (Woodard-USGS)
W73-10998

2K. Chemical Processes

SPECTROGRAPHIC ANALYSIS OF METALS IN FRESHWATER SEDIMENTS,
Eastern Michigan Univ., Ypsilanti. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-10407

RECONNAISSANCE OF CHEMICAL QUALITY OF SURFACE WATER AND FLUVIAL SEDIMENT IN THE PRICE RIVER BASIN, UTAH,
Geological Survey, Salt Lake City, Utah.
J. C. Mundorff.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 39, 1972. 55 p, 13 fig, 3 plate, 5 tab, 22 ref.

Descriptors: *Water quality, *Chemical analysis, *Sediment transport, *Utah, River basins, Hydrologic data, Basic data collections, Climatic data, Streamflow, Geology, Vegetation, Land use, Reservoirs, Water utilization, Water supply, Irrigation, Coal mines, Environmental effects, Maps.
Identifiers: *Price River basin (Utah).

The Price River basin is mainly in Carbon and Emery Counties in east-central Utah, and the total drainage area is about 1,900 square miles. Normal annual precipitation (1931-60) is more than 30 inches in headwaters areas and is less than 8 inches in the downstream part of the basin. Surface rocks in the basin range in age from Jurassic to Quaternary, but the rocks having predominant influence on water quality are marine shales of Creataceous age. The general chemical characteristics of the main stem of the Price River as determined by a reconnaissance during 1969-70 changed markedly between the headwaters and the mouth. The dissolved solids content ranged from less than 400 mg/liter in the headwaters to 2,740 mg/liter near the mouth. Suspended-sediment concentrations as high as 186,000 mg/liter were observed on a tributary, and as high as 111,000 mg/liter were observed on the Price River. A rough estimate of the suspended-sediment discharge of Price River at Woodside was at least 1,400,000 tons during the 1970 water year. (Woodard-USGS)
W73-10423

NONLINEAR STABILITY OF PLANE POISEUILLE FLOW OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 02E.
W73-10428

DETERMINATION OF NANOGRAM LEVELS OF SILVER IN SUSPENDED MATERIALS OF STREAMS RETAINED BY A MEMBRANE FILTER WITH THE 'SAMPLING-BOAT' TECHNIQUE,
Geological Survey, Denver, Colo.
T. T. Chao, and J. W. Ball.
Analytica Chimica Acta, Vol 54, p 166-168, 1971. 2 fig, 7 ref.

Descriptors: *Chemical analysis, *Metals, *Suspended solids, *Trace elements, Streams, Analytical techniques, Spectrophotometry, Sediments, Sampling, Testing procedures, Acids, Filters, Membranes, Spectroscopy.
Identifiers: *Silver determinations, Triisooctyl thiophosphate, Methyl isobutyl ketone, Nitric acid.

As one part of a study on the mechanisms of transport of silver in fluvial media, a number of water samples was collected from various streams in Colorado in the summer months of 1969 to be analyzed for silver. In general, 2.5 liters of water were taken from a stream and filtered through a 4-inch Gelman membrane filter at the sampling site. A plastic pressure filtration unit was used for the filtration of water under a nitrogen pressure of 40 psi. The filtered water was immediately acidified to pH 1 and saved for the determination of soluble silver in water. The analytical method consists of dry-ashing the membrane filter, digestion of the residue with nitric acid, quantitative extraction of silver into TOTP-MIBK (triisooctyl thiophosphate-methyl isobuytl ketone) stripping of silver back into 0.3 M hydrochloric acid, and measurement of the stripped silver with sampling-boat technique. Determinations are made with an atomic absorption spectrophotometer. (Woodard-USGS)
W73-10429

CHEMICAL INTERACTIONS OF ALUMINUM WITH AQUEOUS SILICA AT 25 DEGREES C,
Geological Survey, Washington, D.C.
J. D. Hem, C. E. Roberson, C. J. Lind, and W. L. Polzer.
For sale by GPO, Washington, D C 20402, Price $0.70. Geological Survey Water-Supply Paper 1827-E, 1973. 57 p, 23 fig, 7 tab, 40 ref.

Descriptors: *Water chemistry, *Crystallization, *Clay minerals, Aluminum, Silicates, Hydrogen ion concentration, Mineralogy, Solubility, Kinetics, Weathering, Alkalis (Bases).
Identifiers: *Halloysite.

Solutions containing from 0.00001 to 0.01 moles per liter of aluminum and dissolved silica in various ratios were aged at pH levels between 4 and 10

at 25 deg C. A collodial amorphous product having the composition of halloysite was produced in most solutions. It had a consistent and reversible equilibrium solubility equivalent to a standard free energy of formation of -897 kcal per mole. Most solutions gave consistent solubilities after only a few months of aging. Electron micrographs and diffraction patterns of the synthesized material indicate some crystallinity in the aluminosilicate, but no X-ray diffraction patterns could be obtained even in the material aged 4 years. Aluminum contents of 51 samples of water analyzed for other purposes are in reasonable agreement with the assumption of equilibrium with amorphous clay mineral species similar to the material synthesized in this work. Solubility calculations are summarized graphically for solutions of ionic strength of 0.01 and 0.10. (Knapp-USGS)
W73-10433

A RAPID SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05A.
W73-10434

GEOHYDROLOGIC RECONNAISSANCE AND STUDY PLAN FOR WATER RESOURCES INVESTIGATIONS IN THE BARODA-BROACH AREA, GUJARAT, INDIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-10439

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst. Karnal (India).
For primary bibliographic entry see Field 02G.
W73-10441

THE DETERMINATION OF VANDIUM IN BRINES BY ATOMIC ABSORPTION SPECTROSCOPY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-10442

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 2, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-10445

EFFECT OF ION PAIRING ON THE PH OF SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. R. Kester.
Limnology and Oceanography, Vol. 17, No. 6, p 959-960, November 1972. 12 ref.

Descriptors: *Hydrogen ion concentration, *Water pressure, *Calcium carbonate, Oxidation.
Identifiers: *Ion pairing, *Biogenic oxidation, Dissolution.

The author disagrees with Wangersky's statement that the dominant influence on the pH of water not in contact with the atmosphere results from changes in ion pairing caused by pressure. Instead the cause should be attributed to biogenic oxidation and calcium carbonate dissolution. (Little-Battelle)
W73-10469

GAS-LIQUID-SOLID CHROMATOGRAPHY OF FREE ACIDS,
Rome Univ. (Italy). Istituto di Chimica Analitica.
For primary bibliographic entry see Field 05A.
W73-10473

DETERMINATION OF AMMONIACAL NITROGEN IN THE PRESENCE OF UREA WITH AN AMMONIA ELECTRODE,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Chemical Development.
For primary bibliographic entry see Field 05A.
W73-10474

TWO INSTRUMENTS FOR ACTIVATION ANALYSIS OF SOLUTIONS BY A DILUTION METHOD,
Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
For primary bibliographic entry see Field 07B.
W73-10509

THE EXTRACTION OF THE CHROMIUM (III)--EDTA COMPLEX BY SOLUTIONS OF ALIQUAT-336 IN VARIOUS ORGANIC SOLVENTS,
Leeds Univ. (England). Dept. of Inorganic and Structural Chemistry.
For primary bibliographic entry see Field 05A.
W73-10523

STUDIES IN THE COMPLEX FORMATION OF METAL IONS WITH SUGARS. PART I. THE COMPLEX FORMATION OF COBALT (II), COBALT (III), COPPER (II) AND NICKEL (II) WITH MANNITOL,
Oslo Univ. (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-10524

THE DIRECT DETERMINATION OF CHROMIUM IN URINE BY SELECTIVE VOLATILIZATION WITH ATOM RESERVOIR ATOMIC ABSORPTION,
Environmental Protection Agency, Perrine, Fla. Perrine Primate Lab.
For primary bibliographic entry see Field 05A.
W73-10525

THE INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF THE SULPHATE ION WITH 2-AMINOPERIMIDINE,
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-10527

THE DETERMINATION OF MANGANESE IN URINE BY ATOMIC ABSORPTION SPECTROMETRY,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-10528

THE FLUORIMETRIC DETERMINATION OF PHOSPHATE WITH THIAMINE,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 05A.
W73-10529

ATOMIC FLUORESCENCE CHARACTERISTICS OF COPPER IN VARIOUS PREMIXED FLAMES,
Technical Univ. of Prague (Czechoslovakia). Lab. of Flame Spectrometry.
For primary bibliographic entry see Field 05A.
W73-10531

LARGER DIAMETER COLUMNS FOR MODERN, HIGH SPEED LIQUID CHROMATOGRAPHY,
Delaware Univ., Newark.
J. J. DeStefano.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No.,72-31,983. Ph D Dissertation, 1972. 142 p.

Descriptors: *Efficiencies, *Separation techniques, *Laboratory equipment, Research equipment, Particle size.
Identifiers: *Chromtographic columns, *Column preparation, *High speed liquid chromatography, Sample size, Chemical concentration, Liquid liquid chromatography, Liquid solid chromatography, Adsorbents, Porasil A.

Relatively large internal diameter columns are shown to exhibit superior efficiencies for both retained and unretained solutes when compared to narrow-bore, analytical liquid-liquid (LLC) and liquid-solid (LSC) chromatographic columns. This high level of column performance is ascribed to the 'infinite-diameter' column phenomenon proposed by Knox and Parcher. The controlled surface porosity support used in the LLC studies is shown to be capable of handling only modest amounts of solute without overloading. The totally porous silica adsorbent, Porasil A, used for LSC is found to be better suited for preparative applications because of its higher sample capacity. Sample sizes between 20 and 100 milligrams are demonstrated in two examples of preparative separations. The effects of sample volume and concentration, support particle size, and carrier velocity on column performance are also discussed. (Holoman-Battelle)
W73-10539

STUDIES IN CHEMICAL IONIZATION MASS SPECTROMETRY,
Virginia Univ., Charlottesville,
For primary bibliographic entry see Field 05A.
W73-10541

METHOD FOR HIGH-SPEED LIQUID CHROMATOGRAPHIC ANALYSIS OF BENOMYL AND/OR METABOLITE RESIDUES IN COW MILK, URINE, FECES, AND TISSUES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept.
For primary bibliographic entry see Field 05A.
W73-10547

GAS CHROMATOGRAPHY OF ORGANONITROGEN PESTICIDES, USING A NITROGEN-SPECIFIC DETECTION SYSTEM,
Food and Drug Administration, Buffalo, N.Y.
For primary bibliographic entry see Field 05A.
W73-10548

SODIUM AND MAGNESIUM SULFATE ION PAIRING: EVIDENCE FROM RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W73-10650

SIMULATION OF HYDROCHEMICAL PATTERNS IN REGIONAL GROUNDWATER FLOW,
Alberta Univ., Edmonton. Dept. of Geology.
F. W. Schwartz, and P. A. Domenico.
Water Resources Research, Vol 9, No 3, p 707-720, June 1973. 7 fig, 8 tab, 20 ref.

Descriptors: *Water chemistry, *Hydrogeology, *Simulation analysis, *Groundwater basins, Mass transfer, Equilibrium, Kinetics, *Canada, Mathematical models, Leaching, Weathering, Geochemistry.

UNIVERSITY OF ILL. URBANA CHAMPAIGN

The chemical state of a regional groundwater system in which several processes are acting is described by a simulation model that incorporates partial equilibrium, mass transfer, and reaction kinetics. Mineral dissolution, saturation constraints in dissolution, the degree of saturation, partial pressures of CO2, reaction kinetics, and the residence time of the groundwater flow play different roles in determining the spatial distribution of ionic constituents. Simultaneous evaluation of several geochemical processes permits the study of interdependent phenomena such as shifts in equilibrium concentrations resulting from the addition of common ions by cation exchange or sulfate reduction processes. The utility of the model was demonstrated by applying it to the groundwater reservoir in the Upper Kettle Creek, Ontario, Canada, where a favorable comparison was achieved between the real and the theoretical hydrochemical patterns. (Knapp-USGS)
W73-10664

CHLORIDE BALANCE OF SOME FARMED AND FORESTED CATCHMENTS IN SOUTHWESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia).
A. J. Peck, and D. H. Hurle.
Water Resources Research, Vol 9, No 3, p 648-657, June 1973. 1 fig, 5 tab, 25 ref.

Descriptors: *Saline water, *Leaching, *Salt balance, *Australia, Water quality, Water chemistry, Water balance, Chlorides, Vegetation effects, Land use, Water pollution sources, Saline soils.

Loss of chloride in streamflow from forested catchments in southwestern Australia is only slightly greater than the total annual input from rain and dust. However, salt flow from catchments in which a significant area of the forest vegetation has been cleared for farming is much larger and exceeds salt input by up to 690 kg/ha per yr, or a factor of 21. The net loss of Cl results from decreased storage in catchment soil water. Removal of the forest vegetation increases groundwater discharge of catchments by amounts ranging from about 1 to 13 cm per yr. Characteristic times for equilibration of Cl input and loss on farmed catchments are estimated to range from 30 to 400 years. In equilibrium the salty streams draining farmed catchments would yield water with Cl concentrations acceptable for drinking. (Knapp-USGS)
W73-10669

INORGANIC PHOSPHORUS IN SEAWATER,
Geological Survey, Menlo Park, Calif.
R. A. Gulbrandsen, and C. E. Roberson.
In: Environmental Phosphorus Handbook, E. J. Griffith, A. Beeton, J. M. Spencer and D. T. Mitchell editors: John Wiley and Sons, Inc, New York, N. Y., p 117-140, 1973. 5 fig, 9 tab, 44 ref.

Descriptors: *Phosphorus, *Sea water, *Oceans, *Water chemistry, *Chemical analysis, Water analysis, Phosphorus compounds, Inorganic compounds, Phosphates, Data collections, Atlantic Ocean, Pacific Ocean, Indian Ocean, Nutrients, Marine plants, Mixing, Ocean currents.
Identifiers: Phosphoric acid.

The concentration of phosphorus in seawater is very small, an average of about 2.3 microgram atoms of phosphorus per liter. This is inorganic phosphorus, as contrasted with organic forms, and is the dominant mode of phosphorus occurrence in seawater. The inorganic phosphorus occurs nearly entirely as orthophosphate ions; traces of polyphosphates have been reported and are considered as a possible indicator of pollution. Because phosphorus is one of the elements essential to all forms of life, it is one of the basic nutrient elements, the so-called nonconservative elements in seawater whose proportions with respect to such major constituents as sodium and chlorine are not constant. Interocean mixing, estimated to occur within a time period of about 1000 years, accounts for the nearly constant proportions of the conservative elements in seawater. Most chemical determinations of phosphorus in seawater are of inorganic orthophosphate; however, total phosphorus determinations, which include the organic forms, have been made frequently in recent years. Vertical distributions of phosphorus are tabulated for some of the world's oceans and seas. (Woodard-USGS)
W73-10680

A NETWORK FOR CONTINUOUS MONITORING OF WATER QUALITY IN THE SABINE RIVER BASIN, TEXAS AND LOUISIANA,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W73-10683

TEST RESULTS OF SIX-MONTH TEST OF TWO WATER ELECTROLYSIS SYSTEMS,
McDonnell Douglas Astronautics Com., Huntington Beach, Calif. Biotechnology and Power Dept.
E. S. Mills, and G. W. Wells.
Available from NTIS, Springfield, Va 22151 N73-11095, Price $30.00 printed copy. National Aeronautics and Space Administration Contract Report 128629, October 1972. 541 p, 182 fig, 13 tab, 6 ref. NAS9-12048.

Descriptors: *Electrolysis, *Satellites (Artificial), *Temperature control, Equipment, Testing procedures, Pressure, Oxygen, Monitoring, Computer programs, Evaluation, Water chemistry, Design criteria.
Identifiers: *Water electrolysis systems, *Space stations, NASA, Manned spacecraft.

Two water electrolysis systems used in the NASA space station simulation 90-day manned test of a regenerative life support system at the McDonnell Douglas Astronautics Company were refurbished as required and subjected to 26 weeks of testing. The two electrolysis units are both promising systems for oxygen and hydrogen generation and both needed extensive long-term testing to evaluate the performance of the respective cell designs and provide guidance for further development. These units have been considered seriously in the space station prototype environmental thermal control and life support program. The static vapor feed unit uses a vapor feed and intermittent circulation of electrolyte. The circulating electroyte unit uses a liquid supply with continuous electrolyte circulation. Testing was conducted to evaluate performance in terms of current, pressure, variable oxygen demands, and orbital simulation. An automatic monitoring system was used to record, monitor, and print performance data at one-minute, ten-minute, or one-hour intervals. Performance data are presented for each day of system operation for each module used during the day. Failures are analyzed, remedial action taken to eliminate problems is discussed, and recommendations are made for redesign of future space applications. (Woodard-USGS)
W73-10685

GAS IN GROUND WATER.
For primary bibliographic entry see Field 04B.
W73-10713

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-10744

COLLECTION OF PAPERS OF THE HYDROMETEOROLOGICAL OBSERVATORY OF THE BLACK SEA AND SEA OF AZOV BASINS (SBORNIK RABOT BASSEYNOVOY GIDROMETEOROLOGICHESKOY OBSERVATORII CHERNOGO I AZOVSKOGO MOREY).
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).

A. I. Simonov, editor, Leningrad, 1970, No 8. 87 p.

Descriptors: *Water chemistry, *Sea water, *Inorganic compounds, Salts, Carbon dioxide, Nitrogen compounds, Phosphorus compounds, Organic matter, Productivity, Biomass, Flow, Currents (Water), Winds, Biology, Biochemistry, Dimensions, Seasonal, Annual, Variability, On-site investigations.
Identifiers: USSR, *Black Sea, *Sea of Azov, Silicon, Organic carbon, Mineralization.

Results are presented of investigations of the hydrologic regime of the Black Sea and Sea of Azov. The dynamics of biogenous elements in the seas is examined, and studies are made of currents in the northwestern region of the Black Sea, carbon dioxide in waters of Yalta Bay, exchange of nutrient salts through the Kerch Strait, and organic-matter accumulation in brines and bottom sediments of eastern Sivash lagoons. (See W73-10780 thru W73-10783) (Josefson-USGS)
W73-10779

DYNAMICS OF SILICON IN THE BLACK SEA AS OBSERVED ALONG THE CAPE KHERSONES-BOSPORUS PROFILE (DINAMIKA KREMNIYA V CHERNOM MORE PO MATERIALAM NABLYUDENIY NA RAZREZEMYS KHERSONES--PROLIV BOSFOR),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo morey, Sbornik rabot, No 8, p 22-29, Leningrad, 1970. 3 fig, 6 tab, 7 ref.

Descriptors: *Water chemistry, *Inorganic compounds, *Sea water, *Silica, Salinity, Depth, Profiles, Currents (Water), Phytoplankton, Seasonal, Variability, Analytical techniques.
Identifiers: USSR, *Black Sea, *Silicon.

Distribution of silicon in the Black Sea was investigated to depths of 150 m along the Cape Khersones--Bosporus profile in 1962-67. Observations in January 1962 and February 1965 showed that the silicon content is higher in winter than during other seasons of the year. Average silicon concentrations at the sea surface reached 1,180 micrograms/liter in January and decreased to 850 micrograms/liter in February. The average value in March was 750 micrograms/liter. The silicon content in August averaged 550-650 micrograms/liter and increased in November to 900-950 micrograms/liter. The concentration of silicon is relatively uniform to a depth of 20 m and increases at depths ranging from 50 m to 150 m. The profile distribution of silicon is a dome-shaped isosurface produced by a closed system of circular currents and clearly reflected in the silicon to salinity ratio. (See also W73-10779) (Josefson-USGS)
W73-10780

EXCHANGE OF NUTRIENTS SALTS THROUGH THE KERCH STRAIT (OBMEN PITATEL'NYMI SOLYAMI CHEREZ KERCHENSKIY PROLIV),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
S. A. Nazarenko.
In: Basseynovoya gidrometeorologicheskaya observatoriya Chernogo i Azovskogo morey, Sbornik rabot, No 8, p 48-63, Leningrad, 1970. 1 fig, 7 tab, 6 ref.

Descriptors: *Water chemistry, *Sea water, *Salts, *Phosphates, *Nitrogen compounds, Nitrites, Nitrates, Ammonium salts, Seasonal, Annual, On-site investigations, Silica.
Identifiers: USSR, *Kerch Strait, Black Sea, Sea of Azov, Silicon.

Seasonal, annual, and average long-term exchange of nutrient salts between the Black Sea and Sea of Azov through the Kerch Strait was investigated in hydrochemical studies conducted in 1953-65. The amounts of nutrient salts transported annually from the Sea of Azov into the Black Sea included 352 metric tons of phosphates, 30,000 metric tons of silicon, and 1,055 metric tons of nitrites and nitrates. The amounts of nutrient salts flowing annually into the Sea of Azov from the Black Sea included 137 metric tons of phosphates, 25,000 metric tons of silicon, and 133 metric tons of nitrites and nitrates. The annual loss of nutrient salts from the Sea of Azov was 6,000 metric tons. (See also W73-10779) (Josefson-USGS)
W73-10781

DYNAMICS OF MINERAL AND ORGANIC PHOSPHORUS IN THE SEA OF AZOV AFTER REGULATION OF DON RIVER FLOW (DINAMIKA MINERAL'NOGO I ORGANICHESKOGO FOSFORA V AZOVSKOM MORE POSLE ZAREGULIROVANIYA STOKA REKI DONA),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
S. A. Nazarenko.
In: Basseynovaya gidrometeorologicheskaya observatoriya Chernogo i Azovskogo morey, Sbornik rabot, No 8, p 64-72, Leningrad, 1970. 4 tab, 8 ref.

Descriptors: *Water chemistry, *Phosphates, *Organophosphorus compounds, *Sea water, *Regulated flow, Regulation, Discharge (Water), Biology, Biochemistry, Annual, Seasonal, Variability.
Identifiers: USSR, *Sea of Azov, *Don River, Gulf of Taganrog, Mineralization.

The dynamics of mineral and organic phosphorus in the Sea of Azov was investigated in 1953-66 following regulation of flow of the Don River. In 1953-61, the phosphate content in the open sea was 10 micrograms/liter, while that in the Gulf of Taganrog was 20 micrograms/liter. In 1962-66, the phosphate content decreased to 7 micrograms/liter in the sea and to 13 micrograms/liter in the gulf. In 1958-61, the content of organic phosphorus in the open sea was 70 micrograms/liter, while that in the gulf was 87 micrograms/liter. In 1962-66, the content of organic phosphorus increased slightly, averaging 77 micrograms/liter in the sea and 106 micrograms/liter in the gulf. Annual variations in phosphorus content are associated with biochemical and biological processes in the sea and, to a lesser extent, with river discharge fluctuations. (See also W73-10779) (Josefson-USGS)
W73-10782

ORGANIC MATTER IN THE EASTERN SIVASH (ORGANICHESKOYE VESHCHESTVO V VOSTOCHNOM SIVASHE),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
Yu. G. Slatinskiy.
In: Basseynovaya gidrometeorologicheskaya observatoriya Chernogo i Azovskogo morey, Sbornik rabot, No 8, p 73-82, Leningrad, 1970. 2 tab, 17 ref.

Descriptors: *Organic matter, *Brines, *Bottom sediments, Sedimentation, Lagoons, Islands, Productivity, Biomass, Phytoplankton, Cladophora, Benthos, Depth, Areal, Volume.
Identifiers: USSR, *Sivash, Organic carbon, Water exchange, Mineralization.

The amount of organic matter in brines and bottom sediments of eastern Sivash lagoons in the Crimea is extremely high. The average daily production of organic carbon from 24,000 metric tons of organic matter is 8 mg/liter. The annual accumulation of organic matter is about 13 million metric tons, of which 3.9 million metric tons becomes bottom sediment and 8.65 million metric tons remains in a suspended, colloidal, and dissolved state. A layer 2 mm-thick forms annually as a result of the sedimentation of organic substances. (See also W73-10779) (Josefson-USGS)
W73-10783

'IRON WATER' FROM WELLS: CAUSES AND PREVENTION,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-10785

A CONTRIBUTION TO THE KNOWLEDGE OF PHYSICAL AND CHEMICAL PROPERTIES OF THE GROUND WATERS IN THE SLOVENE KARST,
Yugoslav Academy of Sciences and Arts, Zagreb.
For primary bibliographic entry see Field 02F.
W73-10801

SEPARATION AND PRECONCENTRATION,
Leeds Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 05A.
W73-10861

NEW METHODS FOR THE DETERMINATION OF ELEMENTS IN TRACE AMOUNTS,
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-10862

TITRIMETRIC MICRODETERMINATION OF NICKEL AND COBALT, SEPARATELY AND IN PRESENCE OF EACH OTHER,
Allahabad Univ. (India). Chemistry Labs.
For primary bibliographic entry see Field 05A.
W73-10863

COMPARATIVE CARBOHYDRATE GEOCHEMISTRY OF BAY, SALT MARSH, AND DEEP GULF SEDIMENTS,
Delaware Univ., Newark.
For primary bibliographic entry see Field 02L.
W73-10972

DATING CAVE CALCITE DEPOSITS BY THE URANIUM DISEQUILIBRIUM METHOD: SOME PRELIMINARY RESULTS FROM CROWSNEST PASS, ALBERTA,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02J.
W73-10978

RECONNAISSANCE OF THE MANISTEE RIVER, A COLD-WATER RIVER IN THE NORTHWESTERN PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-10985

AN ANALYSIS OF STREAM TEMPERATURES IN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02G.
W73-10987

TRACE ELEMENT DETERMINATION WITH SEMICONDUCTOR DETECTOR X-RAY SPECTROMETERS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 05A.
W73-11031

SEPARATION AND CHARACTERIZATION OF DIMETHYLNITROBIPHENYL AND DIMETHYLBIPHENYLAMINE ISOMERS BY CHROMATOGRAPHIC AND SPECTROMETRIC METHODS,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
For primary bibliographic entry see Field 05A.
W73-11032

TRACE ELEMENT ANALYSIS IN WATER BY PROTON ACTIVATION,
California Univ., Davis. Dept. of Applied Science.
For primary bibliographic entry see Field 05A.
W73-11033

ON-THE-FLY GAS CHROMATOGRAPHY-INFRARED SPECTROMETRY USING A CHOLESTERIC LIQUID CRYSTAL-EFFLUENT INTERFACE,
Hunter Coll., New York. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-11034

THE USE OF GAS-LIQUID CHROMATOGRAPHY FOR SELECTING EXTRACTIVE SOLVENTS FOR LIQUID EXTRACTION PROCESSES,
For primary bibliographic entry see Field 05A.
W73-11036

COMPARISON OF FLAME AND FLAMELESS ATOMIC ABSORPTION FOR THE DETERMINATION OF CALCIUM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
J. H. Cragin, and M. M. Herron.
Atomic Absorption Newsletter, Vol 12, No 2, p 37-38, March-April 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Calcium, *Methodology, *Snow, *Aqueous solutions, Chemical analysis, Pollutant identification.
Identifiers: *Atomic absorption spectrophotometry, *Flameless atomic absorption spectrophotometry, Precision, Detection limits, Absorbance, Sensitivity, Graphite furnace.

Select glacial snow samples from Greenland were analyzed for calcium by both flame and flameless atomic absorption in order to compare the suitability of these techniques. A Perkin-Elmer Model 303 atomic absorption spectrophotometer and a single-element Ca Intensitron hollow cathode lamp were used. Flameless absorption values were obtained with an HGA-70 Graphite Furnace which was modified to interrupt the inert gas flow during atomization. Comparisons of the results from the two methods showed good agreement in reference to standard deviations. The addition of 0.1 percent La to samples gave no increase in absorbance indicating the absence of interferences for flame determinations. Consequently all flame measurements were performed without this additive. Precision was appreciably better with the graphite furnace: average standard deviations are 1.9 micrograms/l for the flame and 0.3 microgram/l for the furnace. Flame and flameless atomic absorption determinations of calcium compare well in the 5 to 20 micrograms/l range. Below 5 micrograms/l calcium, the Graphite Furnace because of its improved precision is preferred to the flame. (Holoman-Battelle)
W73-11037

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

THE APPLICATION OF FLAMELESS ATOMIC ABSORPTION IN HYDROGENOCHEMICAL ANALYSIS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
W. M. Edmunds, D. R. Giddings, and M. Morgan-Jones.
Atomic Absorption Newsletter, Vol 12, No 2, p 45-49, March-April 1973. 6 fig, 3 tab, 8 ref.

Descriptors: Methodology, Chemical analysis, *Water analysis, *Brines, *Heavy metals, *Trace elements, *Groundwater, Saline water, Manganese, Iron, Nickel, Copper, Cobalt, Chromium, Molybdenum, Lead, Cadmium, Solvent extractions, Pollutant identification, Water pollution.
Identifiers: *Heated graphite atomizer, *Flameless atomic absorption spectrophotometry, Sensitivity, Accuracy, Detection limits, Standard addition technique, Precision, Chemical interference.

A satisfactory procedure for the determination of trace metals in natural waters, based on the use of the heated graphite atomizer (HGA) has been developed. Mn, Fe, Ni, Cu, Co, Cr, Mo, Pb and Cd were investigated in water samples varying from dilute groundwaters to brines. Sample sizes were 10, 20, 50 or 100 microliters and the sample was injected into the furnace in triplicate by applying a constant pressure. Measurements were made using the standard calibration curve and the standard addition procedures. The overall precision varied between plus or minus 5 percent to plus or minus 10 percent at the 10 micrograms/l level; precision for Cu, Co, Mn, Mo and possibly Ni was better than for the other elements. The sensitivity achieved was in general comparable with that quoted for the HGA by other workers, except for cadmium which is approximately ten times less sensitive. The detection limits shown for Co, Cr, Cu, Mn, Mo and Pb are generally of the same order as those quoted by the manufacturers, whereas the limit for Ni is slightly better. Relatively similar detection limits are obrained by solvent extractions. The results of solvent extraction and direct flame analyses of Cyprus groundwater samples showed good agreement in terms of accuracy of the method. (Holoman-Battelle)
W73-11039

SELECTIVE DETERMINATION OF HETERO--ORGANICS BY A DUAL-CHANNEL DETECTOR BASED ON FLAME CONDUCTIVITY AND EMISSION,
Missouri Univ., Columbia. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05A.
W73-11040

2L. Estuaries

EFFECTS OF MOSQUITO CONTROL DITCHING ON ESTUARINE ECOSYSTEMS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05G.
W73-10410

THE INFLUENCE OF BENTHIC BARK DEPOSITS ON AQUATIC COMMUNITY AND THE QUALITY OF NATURAL WATERS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 04C.
W73-10411

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY,
Geological Survey, Philadelphia, Pa.
L. J. Mansue, and A. B. Commings.
Geological Survey open-file report, 1973. 30 p, 2 fig, 5 tab, 18 ref.

Descriptors: *Sediment transport, *Sediment yield, *Sediment load, *Delaware River, Environmental effects, Urbanization, Urban hydrology, Data collections, Geology, Topography, Land use, Suspended solids, Sedimentation, Erosion, River basins, Watershed management, Pennsylvania, New Jersey, Delaware.
Identifiers: *Delaware River basin.

The quantity of sediment transported by streams draining into the Delaware estuary from Pennsylvania, New Jersey, and Delaware varies really according to geology, physiography, and land use. Of the estimated total sediment load of 1.6 million tons entering the Delaware estuary annually, about 49% is contributed by the Delaware River main stem, 34% by Pennsylvania tributaries, and 17% by New Jersey and Delaware tributaries. The highest sediment yielding basins are in the Piedmont province in Pennsylvania and Delaware, where sediment yields range from 100 to 1,000 tons per sq mi annually. Inner Coastal Plain basins in New Jersey and Delaware have a sediment yield of from 50 to 250 tons per sq mi annually. Basins carrying the least sediment per square mile are located in the outer coastal plain in southern New Jersey and Delaware. Yields in these stream basins range from 5 to 10 tons per sq mi annually. Streams' draining areas in the development phases of urbanization, where exposure of soils by earthmoving related to highway or new housing construction, have yields two to four times higher than those in adjacent nonurban or stable urban areas. (Woodard-USGS)
W73-10425

DEEP WATER RENEWAL IN SAANICH INLET, AN INTERMITTENTLY ANOXIC BASIN,
Washington Univ., Seattle. Dept. of Oceanography,
For primary bibliographic entry see Field 05B.
W73-10432

MATHEMATICAL SIMULATION OF TIDAL TIME-AVERAGES OF SALINITY AND VELOCITY PROFILES IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge.
J. S. Fisher, J. D. Ditmars, and A. T. Ippen.
Available from NTIS, Springfield, Va. 22151 as COM 73-10053 Price $3.00 printed copy; $0.95 microfiche. Massachusetts Institute of Technology Sea Grant Project Office Report MITSG72-11, July 31, 1972. 193 p, 40 fig, 21 tab, 27 ref, 3 append. NOAA Grant GH-88 and 2-35150.

Descriptors: *Saline water intrusion, *Estuaries, *Mathematical models, *Tidal effects, Velocity, Salinity, Flow profiles, Flow rates, Flumes, Input-output analysis, Equations, Correlation analysis, Saline water-freshwater interfaces, Analytical techniques.

A mathematical model is developed using analytical techniques to determine the longitudinal and vertical distributions of velocities and salinities, averaged over a tidal period, for mixed but partially stratified estuaries. The flow field is assumed laterally homogeneous and the estuary width and depth are assumed to be functions of the longitudinal coordinate only. Required inputs to the model include the salt intrusion length, the ocean boundary salinity, the distribution of the depth-averaged salinity, and the freshwater discharge. The governing equations are the vertical and longitudinal equations of motion, continuity, salt conservation, and an equation of state. The key assumption is that the longitudinal salinity gradient is independent of depth. This decouples these equations and thus permits an analytical solution. Using data from laboratory flume tests from the U. S. Army Waterways Experiment Station and the Delft Hydraulics Laboratory, and field surveys from the James River Estuary in Virginia, the model solutions are used to find correlations for the mean vertical transfer coefficients of mass and momentum with gross characteristics of the estuary. These correlations, plus the results from a one-dimensional numerical model, permit this analytical model to be used as a predictor of the velocity and salinity profiles in estuaries and to relate changes in freshwater discharge to possible changes in the location of shoaling zones. (Woodard-USGS)
W73-10436

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
For primary bibliographic entry see Field 05B.
W73-10437

THE EVOLUTION OF LEWES HARBOR,
Delaware Univ., Newark. Dept of Geology.
For primary bibliographic entry see Field 02J.
W73-10438

A TWO-LAYER MODEL OF MUD TRANSPORT IN THE THAMES ESTUARY,
Hydraulics Research Station, Wallingford (England).
N. V. M. Odd, and M. W. Owen.
Institution of Civiel Engineers Proceedings Paper 7517 S, Supplement 9, 1972. 30 p, 13 fig, 1 tab, 17 ref.

Descriptors: *Sediment transport, *Mud, *Estuaries, *Stratified flow, *Mathematical models, Saline water intrusion, Saline water-freshwater interfaces, Density stratification, Tides, Currents (Water), Mixing, Suspended load, Flood control, Dams.
Identifiers: *Thames Estuary (England).

A two-layer mathematical model simulates mud transport in a well-mixed estuary. The main purpose of the model is to simulate mud transport processes and the effects on the regime of siltation of continuous operation of various tidal barriers proposed for flood protection in the Thames Estuary. A method is given for calculating two-layer tidal flow with internal gravitational circulation induced by density gradients. Methods for calculating the rates of erosion and deposition of mud are based on field and laboratory experiments. The application of the method characteristics is used to solve the mass balance equations for the transport of mud suspended in two-layer flow. (Knapp-USGS)
W73-10443

TRACER SIMULATION STUDY OF POTENTIAL SOLUTE MOVEMENT IN PORT ROYAL SOUND, SOUTH CAROLINA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-10446

MARINA DEL REY: A STUDY OF ENVIRONMENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 05B.
W73-10465

(CALIFORNIA COMPREHENSIVE OCEAN AREA PLAN). APPENDIX I: PERMANENT COASTAL ZONE DATA INVENTORY AND INFORMATION SYSTEM,
California State Dept. of Navigation and Ocean Development, Sacramento.
For primary bibliographic entry see Field 07C.
W73-10552

POLLUTION IN SOME BRITISH ESTUARIES AND COASTAL WATERS.
Royal Commission on Environmental Pollution, London (England).
For primary bibliographic entry see Field 05B.
W73-10554

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHINGTON, D.C. 2-3 JUNE 1971.
For primary bibliographic entry see Field 05G.
W73-10570

DEPARTMENT OF INTERIOR PROGRAM,
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-10571

FEDERAL INTERACTION WITH STATES,
Virginia Inst. of Marine Sciences, Gloucester Point.
For primary bibliographic entry see Field 05G.
W73-10572

LONG ISLAND'S APPROACH TO ENVIRONMENTAL QUALITY,
Ocean Systems, Inc., Reston, Va.
For primary bibliographic entry see Field 05G.
W73-10573

DELAWARE MARINE RELATED STUDY,
Hercules, Inc., Wilmington, Del.
For primary bibliographic entry see Field 05G.
W73-10574

THE GULF ENVIRONMENTAL PROGRAM,
Gulf Universities Research Corp., Galveston, Tex.
For primary bibliographic entry see Field 05G.
W73-10575

REPORT OF STUDY ON SHIPS CHANNELS AND HARBORS,
American Association of Port Authorities, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-10576

CALIFORNIA'S MARINE PROGRAM,
Modern Management, Beverly Hills, Calif.
For primary bibliographic entry see Field 05G.
W73-10577

CHEMICAL PANEL REPORT,
Union Carbide Corp., New York.
For primary bibliographic entry see Field 05G.
W73-10578

OCEAN UTILIZATION AND COASTAL ZONE DEVELOPMENT.
Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.

Report No MITSG 73-3, 1973. 29 p, 12 ref. NOAA GH-88.

Descriptors: *Coasts, *Resources, *Management, Research, Engineering, Education, Harbors, *Estuaries, Model studies, Transportation, Mineralogy, Proteins, Oil, Oxidation, Bacteria, *Water pollution control, Resource development.
Identifiers: Sea Grant activities.

Sea grant activities of the Massachusetts Institute of Technology from June 1, 1970 to June 30, 1972 are summarized. Research projects include: new dimensions of U.S. marine policy, estuary modeling, ocean transportation, the future of Atlantic ports, squid protein concentrate; and oil oxidation by marine bacteria. Education and training projects encompass: power, pollution, and public policy; ocean engineering; marine transportation; and evolution and utilization of marine mineral resources. (Ensign-PAI)
W73-10579

A PROTOTYPE TOTALISING CURRENT-METER (MARK II); A SELF-MOORED VERSION FOR NEAR-SURFACE USE ESPECIALLY IN FOUL WATER ESTUARIES IN CONNECTION WITH POLLUTANT DISPERSAL STUDIES,
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 05B.
W73-10580

COASTAL EROSION IN THE NILE DELTA,
United Nations Educational, Scientific and Cultural Organization, New York.
For primary bibliographic entry see Field 02J.
W73-10681

A STUDY OF THE PROBABLE EFFECTS OF THE DIVERSION OF FLOOD WATERS UPON THE ECOLOGY OF THE CONNECTICUT RIVER ESTUARY,
Connecticut Univ., Storrs.
M. J. Westerfield, and W. C. Kennard.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix F, 23 p, 3 fig, 1 tab, 42 ref. OWRR C-2169 (No. 3377) (1).

Descriptors: *Ecology, *Estuarine environment, Water quality, Flood flows, *Diversion, Temperature, Salinity, Nutrients, Turbidity, Zooplankton, Phytoplankton, Ecosystem, *Inter-basin transfers.
Identifiers: *Connecticut River Estuary.

The ecology of the Connecticut River estuary and the possible effects of the diversion of flood waters out of the basin are described. Emphasis is placed on describing the predominant characteristics of the ecosystem in the tidal stretch of the Connecticut River, including its bacteriology, phytoplankton, zooplankton, and fish populations; identifying factors such as river flow, salinity, temperature, turbidity, and nutrients which are key determinants of the nature of the ecosystem; and predicting possible changes in these factors as a result of the flood water diversions. Several changes such as higher temperatures, increased salinity, decreased flows and water currents, and more deposited solids are discussed. Each of these changes by itself may not be significant but the combined effect may significantly change the estuarine ecosystem. However, a thorough study of the estuary is needed before a proper evaluation can be made. (See also W73-10726). (Elfers - North Carolina).
W73-10732

SHELF SEDIMENT TRANSPORT: PROCESS AND PATTERN.
For primary bibliographic entry see Field 02J.
W73-10746

PREDICTING INITIAL MOTION AND BEDLOAD TRANSPORT OF SEDIMENT PARTICLES IN THE SHALLOW MARINE ENVIRONMENT,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02J.
W73-10749

OBSERVATIONS ON WIND, TIDAL, AND DENSITY-DRIVEN CURRENTS IN THE VICINITY OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 02J.
W73-10752

MIGRATION OF TIDAL SAND WAVES IN CHESAPEAKE BAY ENTRANCE,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 02J.
W73-10765

WATER CIRCULATION AND SEDIMENTATION AT ESTUARY ENTRANCES ON THE GEORGIA COAST,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 02J.
W73-10766

LINEAR SHOALS ON THE ATLANTIC INNER CONTINENTAL SHELF, FLORIDA TO LONG ISLAND,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W73-10768

NEARSHORE SEDIMENTARY PROCESSES AS GEOLOGIC STUDIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 02J.
W73-10773

DYNAMICS OF MINERAL AND ORGANIC PHOSPHORUS IN THE SEA OF AZOV AFTER, REGULATION OF DON RIVER FLOW (DINAMIKA MINERAL'NOGO I ORGANICHESKOGO FOSFORA V AZOVSKOM MORE POSLE ZAREGULIROVANIYA STOKA REKI DONA),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
For primary bibliographic entry see Field 02K.
W73-10782

STUDY ON THE ACOUSTIC CHARACTERISTICS OF UNDER-WATER: FLOATING MUD-I, (IN JAPANESE),
Tokai Univ., Tokyo (Japan). Coll. of Marine Science and Technology.
For primary bibliographic entry see Field 05B.
W73-10803

A COMPARISON OF MICROARTHROPOD POPULATIONS IN SEWAGE-EXPOSED AND SEWAGE-FREE SPARTINA SALT MARSHES,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10814

HEAVY METALS IN BRITISH WATERS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W73-10851

ORGANIC MERCURY COMPOUNDS IN COASTAL WATERS,
Connecticut Univ., Groton. Marine Sciences Inst.
For primary bibliographic entry see Field 05A.
W73-10855

LIBRARY OF U. URBANA CHAMPAIGN

THE DISTRIBUTION OF HEAVY METALS IN SEDIMENTS OF SORFJORD, WEST NORWAY,
Edinburgh Univ. (Scotland). Grant Inst. of Geology.
For primary bibliographic entry see Field 05B.
W73-10865

ECOLOGICAL SIGNIFICANCE OF THE DISCHARGE OF TREATED WASTE WATERS INTO COASTAL WATERS,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05C.
W73-10876

PRODUCTIVITY PROBLEMS OF FRESHWATERS.
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-10895

DIURNAL VERTICAL MIGRATION OF AN ESTUARINE CLADOCERAN, PODON POLYPHEMOIDES, IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
H. P. Bosch, and W. R. Taylor.
1972, 29 P. 7 FIG, 19 REF. AEC AT (30-1)3497 and AT (11-1)3279.

Descriptors: *Diurnal, *Vertical, *Migration, *Estuaries, *Crustaceans, Chesapeake Bay, Zooplankton, Tides, Light, Currents (Water).
Identifiers: *Podon polyphemoides.

Quantitative pump samples of Chesapeake Bay zooplankton, made to determine whether the cladoceran, Podon polyphemoides, changed its position in the water column with respect to time, indicated that a downward migration occurred shortly before sunset and an upward migration before dawn. A similar three day study a year later confirmed the results and showed that the podonids (all asexual females) were not impeded in their migration by saline or pycnal stratification. The level to which the population rises within the water column may be dictated by ambient light. Day and night plankton samples taken along the axis of the bay showed the vertical migratory pattern of the podonids to be a general phenomenon throughout the estuary. It is thought that the downward component of the migration, shown to be diurnal behaviour and independent of the tidal cycle, is due to passive sinking attending a decrease in swimming activity. The vertical migration of the podonids from the upper part of the two-layered circulation during the night returns individuals advected seawards during the day. This behaviour is probably an important factor in allowing this species to maintain its large populations within the dynamic estuarine environment. (Jones-Wisconsin)
W73-10941

TRACE METALS IN CORES FROM THE GREAT MARSH, LEWES, DELAWARE.
Delaware Univ., Newark. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-10971

COMPARATIVE CARBOHYDRATE GEOCHEMISTRY OF BAY, SALT MARSH, AND DEEP GULF SEDIMENTS,
Delaware Univ., Newark.
F. M. Swain, and J. M. Bratt.
Available from NTIS, Springfield, Va 22151 as COM-73-10205 Price $3.00 printed copy; $0.95 microfiche. College of Marine Studies Report DEL-SG-11-72, December 1972. 13 p, 7 tab, 7 ref. (Reprint from Advances in Organic Chemistry, p 415-425, 1971). NOAA Grant GH-109.

Descriptors: *Sediments, *Carbohydrates, *Bays, Sampling, Data collections, Marshes, Gulfs, Coasts, Delaware, New Jersey, Mexico, Correlation analysis, Evaluation, Geochemistry, Bottom sediments, Organic compounds.
Identifiers: *Bottom sediment sugars.

Carbohydrate components of cores of sediments from Broadkill Marsh, Delaware, Delaware Bay, and from 1,210 fathom depth in the southern Gulf of California include a variety of free sugars and polymeric sugars, the latter including small amounts of recognizable polysaccharide structures. Free sugars in peat and tidal-marsh silts of Broadkill Marsh form generally 5% or less of the total sugars and consist mainly of glucose. In the fine silty and clayey sands of lower Delaware Bay glucose also is the principal free sugar but comprises 20%-50% or more of the total extractable sugars. Free sugars in the radiolarian-diatom-foraminiferal clays of the Gulf of California are richer than in the marsh and bay sediments but are only 1%-2% of the total sugars in the gulf sediments. Monosaccharides extracted with acid from these sediments probably occurred in some polymeric form but mainly not as identifiable polysaccharides. In the Boradkill Marsh silts and peat such sugars range from 0.2 to 6.8 mg/g and include galactose, clucose, mannose, arabinose, xylose, ribose, rhammose, and rarely maltose. Diatoms, marine algae and marsh grasses (Distichlis, Spartina, and Phragmites) have been the principal source material. Polymeric sugars in Delaware Bay sediments are less than in the marsh sediments and range from 0.06 to 0.26 mg/g. Marsh grass debris, marine algae, and diatoms also appear to have been the source for the bay sediment sugars. The polymeric sugars of Gulf of California sediments average quite high and range from 1.8 to 3.4 mg/g. The source of this material is apparently settled plankton and perhaps some contribution from land plants that have floated to sea. The preservation of so much carbohydrate material in the deepwater sediments is surprising in view of the distance it has to settle. (Woodard-USGS)
W73-10972

TIDAL CURRENTS AND ZIG-ZAG SAND SHOALS IN A WIDE ESTUARY ENTRANCE,
Old Dominion Univ., Norfolk, Va.
J. C. Ludwick.
Available from NTIS Springfield, Va 22151 AD-755 735, Price $3.00 printed copy; $0.95 microfiche. Institute of Oceanography Technical Report No 7, January 15, 1973. 102 p, 22 fig, 9 tab, 44 ref, 3 append. ONR-GP Contract N00014-70-C-0083.

Descriptors: *Sedimentation, *Inlets (Waterways), *Estuaries, *Chesapeake Bay, *Tidal effects, Tides, Flow rates, Sediment transport, Sediment distribution, Shoals, Environmental effects, Levees, Data collections.

Fourteen 27-hour tidal current stations were maintained in the entrance to Chesapeake Bay in a 40 sq mi area of subtidal sand banks and channels where the average water depth is 21 feet. At ebb strength, surface current speed ranged from 4.33 to 2.11 ft/sec; near-bottom speed ranged from 2.56 to 0.73 ft/sec. At flood strength, surface current speed ranged from 3.43 to 1.86 ft/sec; near-bottom speed ranged from 2.12 to 1.15 ft/sec. Near the bottom at most stations, floodflow dominates over ebb flow in both peak speed and duration. Net transport of bed sediment is generally ebb directed. Zig-zag shoals extend from the north cape, three-fourths of the distance to the south across the entrance. This line of shoals is comprised of oppositely opening sinuses, or parabolas, which are with distance to the south alternately ebb dominated and flood dominated. The shoals represent spit building action in the presence of strong reversing tidal currents. Other shoals in the entrance are due to subaqueous levee building marginal to main channels. Still other shoals in the entrance are constructed when a flood-dominated channel intersects the ebb-directed path of net sediment transport, the entrapped sediment then being flushed landward to form a secondary shoal when spreading of the flood current occurs. (Woodard-USGS)
W73-10982

MICROBIAL COMMUNITY STRUCTURE IN CONTAMINATED ESTUARIAN SEDIMENTS,
North Texas State Univ., Denton.
For primary bibliographic entry see Field 05C.
W73-11025

OBSERVATIONS ON THE TRANSPARENCY OF THE WATERS OF THE PULICAT LAKE WITH PARTICULAR REFERENCE TO PLANKTON PRODUCTION,
Central Inland Fisheries Research Inst., Madras (India).
For primary bibliographic entry see Field 05C.
W73-11046

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALINATION PLANT,
Auscoteng Pty Ltd., Wayville, (Australia). (assignee).
N. L. Foley.
U. S. Patent No. 3,725,206, 3 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 301, April 3, 1973.

Descriptors: *Patents, *Desalination, *Evaporators, *Condensation, *Heat exchange, Seawater, Brine, Separation techniques, Potable water, Equipment.

This desalination plant comprises an evaporator having a condenser within it for heat exchange purposes. The water to be desalted is drawn by means of a low pressure system from a supply tank through a heat exchange tank. The water finally enters the evaporator through an air separation chamber. The air separation chamber is connected by a line and a heat exchanger to a brine pump. The pump serves to draw off any air which enters the system with the water and at the same time draws off a quantity of brine. A blower is used to provide heat of compression and to establish a vapor flow from the evaporator to the condenser and to establish a lesser degree of high vacuum within the condenser so that the latent heat of vaporization of a fluid condensing will flow from the condenser into the saline water. (Sinha-OEIS)
W73-10589

MULTIPLE EXPANSION FLASH EVAPORATOR COMPRISING A CONTINUOUS CASING WITH A CENTRAL EVAPORATION CHAMBER,
Societa Italiana Resine S.p.A, Milan (Italy). (assignee)
D. Barba, C. D'Agostino, and G. Liuzzo.
U. S. Patent No 3,720,586, 2 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 908, No 2, p 427, March 13, 1973.

Descriptors: *Patents, *Desalination, *Condensation, Sea water, Potable water, Evaporation, Water treatment, Equipment, *Heat exchangers, *Flash distillation.
Identifiers: *Evaporation chambers.

A multiple expansion flash evaporator comprises a continuous casing, vertical longitudinal baffles dividing the casing into a central evaporation zone

and two side condensation zones in communication with the central zone. A number of vertical transverse baffles divides the evaporator into a succession of expansion chambers with flow openings between them. A multi-tube heat exchanger runs the length of each condensation zone. (Sinha-OEIS)
W73-10601

3B. Water Yield Improvement

PREDICTING DEGREE DAY SNOW MELT FACTORS WITH CROWN CLOSURE IN ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02E.
W73-10697

WOODY PHREATOPHYTES ALONG THE BRAZOS RIVER AND SELECTED TRIBUTARIES ABOVE POSSUM KINGDOM LAKE,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
F. E. Busby, Jr., and J. L. Schuster.
Texas Water Development Board, Austin, Report 168, April 1973. 41 p, 12 fig, 6 tab, 15 ref, 6 append.

Descriptors: *Water loss, *Phreatophytes, *Texas, *Arid lands, Data collections, Aerial photography, Remote sensing, Aircraft, On-site investigations, Correlation analysis, Meteorological data, Precipitation (Atmospheric), Evaporation, Temperature, Vegetation, Cottonwoods, Mesquite, Rivers, Lakes, Flood plains, Water yield improvement, Soil-water-plant relationships.
Identifiers: *Brazos River (Tex), Possum Kingdom Lake, *Saltcedar.

In the arid western part of Texas, phreatophytes along streams remove large quantities of water from a very limited supply. The increase in area and density of these plants over the years, and the resultant increase in their water consumption, are of concern to the Texas Water Development Board. Woody phreatophyte vegetation was inventoried along the Brazos River upstream from Possum Kingdom Lake to the confluence of the Double Mountain and Salt Forks. The kinds, amounts, distribution, history of spread, and volume density of the phreatophytes were determined along with their relation to flood-plain location. Saltcedar is the most widely distributed phreatophyte in the study area, and usually occurs in a dense stand adjacent to the river channel. It dominated 18 precent of the river flood plain in 1940, increasing to 28 percent in 1950 and 36 percent in 1969. Mesquite occurs on the outer portion of the flood plain, and occurs extensively where the flood plain is wide. It has spread slightly toward the river channel, invading 760 additional acres from 1940 to 1969. Average volume density is 27%, and total growth is equivalent to 2,181 acres at 100% volume density. (Woodard-USGS)
W73-10745

CONVERTING CHAPARRAL TO GRASS TO INCREASE STREAMFLOW,
Forest Service (SDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. A. Ingebo.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 181-192, 1972. 5 fig.

Descriptors: *Chaparral, *Grasses, *Streamflow, *Water supply, *Water harvesting, Surface waters, Watershed management, Forest management, Rainfall-runoff relationships, Treatments, Arizona, Arid lands.

Chaparral covers 4 million acres in Arizona. There is interest in determining how much these lands contribute to surface water supply, and how this contribution could be changed by conversion of chaparral cover to grass or grass forb. Results from treatment in the Whitespar watersheds are interpreted. Live oak and true mountain mahogany dominate the study area, which averages 22.7 inches of annual precipitation. Whitespar B watershed was converted to grasses in 1967, and litter was not disturbed. The 246 acre watershed produced more streamflow than the untreated, 303-acre control which tended to remain intermittent. Prior to treatment, streamflow in both watersheds was quite well synchronized. Watershed B has since had continual flow. Winter flows contribute about 77 percent of the increased streamflow volume. The degree of effect is still under study, but a new rainfall-runoff relationship for the treated watershed is necessitated. (See also W73-10818) (Popkin-Arizona)
W73-10831

WEATHER MODIFICATION IN ARIZONA, 1971,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
H. B. Osborn.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 193-207, (1972). 14 ref.

Descriptors: *Weather modification, *Thunderstorms, *Cloud seeding, *Analysis, *Clouds, Winds, Rainfall, Precipitation (Atmospheric), Arizona.

There have been many efforts in recent years to modify thunderstorms through cloud seeding. Collective cloud seeding efforts in Arizona before 1971 are reviewed and an operational convective cloud seeding program carried out in Arizona in the summer of 1971 is analyzed. The comprehensive Santa Catalina Cloud Seeding Experiment (1957 to 1964) was a randomized seeding using silver iodide. Results of this experiment are uncertain as numerous interpretations are possible. Numerous individual experiments from 1966 to 1970 at Flagstaff were conducted, with uncertain results. An intensive program of seeding individual cumulus clouds with silver iodide was carried out in the summer of 1971 in central and eastern Arizona. No statistically significant changes were noted. Results of the Catalina Experiment imply that seeding decreased rainfall on and downwind from the target. Two other experiments were inconclusive. Nine figures show precipitation patterns. (See also W73-10818) (Popkin-Arizona)
W73-10832

AQUATIC PLANT CONTROL PROGRAM.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W73-10951

MECHANICAL EQUIPMENT USED FOR AQUATIC PLANT CONTROL IN LOUISIANA,
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 04A.
W73-10952

CURRENT INVESTIGATIONS IN THE JACKSONVILLE DISTRICT CONCERNING MECHANICAL HARVESTING OF OBNOXIOUS AQUATIC PLANTS,
Army Engineer District, Jacksonville, Fla. Aquatic Plant Control Section; Florida Dept. of Natural Resources, Tallahassee; and Florida State Game and Fresh Water Fish Commission, Tallahassee.
For primary bibliographic entry see Field 04A.
W73-10953

AQUATIC PLANT CONTROL IN THE PANAMA CANAL,
Corps of Engineers, Philadelphia, Pa. Operations Div.
For primary bibliographic entry see Field 04A.
W73-10954

BENEFICIAL AQUATIC PLANTS IN COASTAL AREAS,
Army Engineer District, Mobile, Ala.
H. McClellan.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 31-36, 1972. 5 ref.

Descriptors: *Aquatic plants, *Estuaries, *Tidal marshes, *Coastal marshes, Productivity, Algae, Bacteria, Periphyton, Diatoms, Ecosystems, Biological communities, Florida, Mangrove swamps, Benthic flora, Detritus, Bayous, Plant populations, Grasses.
Identifiers: *Atlantic coast, *Gulf coasts, Sea grass beds.

Coastal zone plants whose productivity is due to autochtonous material are described. Along the edge of the coastal zone is the tidal marsh, a most dynamic unit of nature. The marsh also functions for many purposes, including dumping, industries, boat channels, meadow hay, mosquitoes, spawning, fish food factories, spots for waterfowl, and beautiful shore scenes. On the Atlantic and Gulf coasts, the grasses, Spartina alterniflora and S. patens, dominate. The first grows where currents are strong and the latter, used as hay, forms a carpet on the flats. The black rush, Juncus roemerianus, forms broad expanses on high marsh in southern areas and J. gerardii in northern marshes. Distichlis spicata, a short fine grass, grows in more waterlogged spots of high marsh; Salicornia lives on the salt marsh proper. In south Florida, mangrove begins to replace Spartina. On bottoms of ponds and bayous occur benthic algae and bacteria whose nitrogen-fixing is important. Benthic algae are grazed by herbivorous fishes. Sea grass beds afford cover for organisms. Actually the detritus is of major importance within the coastal zone. Caostal zone plant control should be approached cautiously. (See also W73-10951) (Jones-Wisconsin)
W73-10955

MECHANICAL EQUIPMENT 'WEED WITCH' FOR AQUATIC PLANT CONTROL,
Army Engineer Div. South Atlantic, Atlanta, Ga.
J. J. Raynes.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 37-39, 1972.

Descriptors: *Aquatic weed control, *Mechanical equipment, Maryland, Turbidity, Operating costs, Construction costs, Performance.
Identifiers: *'Weed Witch', Severn River (Md).

The 'Weed Witch' is a piece of mechanical equipment for controlling aquatic vegetation; by disturbing the bottom sediment, it uproots the vegetation. It consists primarily of pumps connected to a multiple header system of vertical plastic pipes terminating in high pressure jets or spray heads adjusted as needed for positioning near the river bottom. The uprooted plants generally float and are moved out by river currents. The pertinent structural facts, the costs of operation and construction, the method of operation, and effectiveness are given. It is not without limiting factors, for it requires relatively flat bottoms without underwater obstructions such as stumps, debris, and piles. The disposal of uprooted aquatics could create problems if allowed to disperse by natural currents or to deposit on shore, particularly in highly populated and

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developed areas. Fragments of many of the underwater aquatic plants will spread and create new colonies of growth unless they are in close proximity and are transported by river currents to high saline waters which are generally toxic to most problem aquatic plants. In operation, the stirring of the bottom causes the water to become very turbid and muddy. (See also W73-10951) (Jones-Wisconsin)
W73-10956

SUMMARY OF CO2 LASER-WATER HYACINTH LABORATORY RESEARCH,
Athens Coll., Ala. Dept. of Biology.
R. W. Couch.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 41-45, 1972.

Descriptors: *Aquatic weed control, *Radiation, *Water hyacinth, Electromagnetic waves, Light intensity, Plant morphology, Pigments, Irradiation, Plant growth, Photosynthesis, Chlorophyll, Inhibition.
Identifiers: *Carbon dioxide laser, Hill reaction, Neodymium laser, Duckweed, Laser.

A nitrogen-carbon dioxide-helium laser system for control of aquatic weed growth was demonstrated. Water hyacinth plants were most affected. No anatomical damage could be found in either fresh nor in prepared stained sections, although there seemed to be a faster disintegration of tissues associated with the plant's photosynthetic mechanism than for surrounding tissues. Several trends were apparent. Both plant counts and dry matter wrights led to the conclusion that at least 0.5-joule/sq cm carbon dioxide laser energy was necessary to obtain inhibition of plant growth. The C-14 dioxide-fixation studies showed the lower threshold of energy necessary for plant growth inhibition was somewhat higher than the 0.5-joule/sq cm rate, but less than 4.4-joule. Evidence showed that reirradiation did not appreciably improve control. Physiological studies showed that the laser radiation was inhibiting light reaction phase of photosynthesis rather than dark reaction phase. Reduction was apparently brought about by inhibition of production of the photosynthetic pigments responsible for conversion of light energy to chemical energy. Another experiment was conducted with water hyacinths using a neodymium laser. The effects of 10.6 micron laser energy on duckweed indicated excellent control at the 10-joule/sq cm radiation rate. (See also W73-10951) (Jones-Wisconsin)
W73-10957

FIELD LASER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Decell.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 47-50, 1972. 1 fig.

Descriptors: *Aquatic weed control, *Plant growth, *Water hyacinth, Inhibition, Prototypes, On-site tests, Costs, Nutrients, Irradiation, Plant physiology.
Identifiers: Lasers, Waterways Experiment Station.

A prototype of a field carbon dioxide laser is being planned to evaluate its control of water hyacinth growth. Two basic types were considered and the Electric Discharge Convection Laser proved to be more economical to construct and operate. Data have been analyzed in an effort to isolate the variables contributing to growth reduction of the irradiated water hyacinths. A validated growth curve has been generated from a separate data source and an equation has been written for this curve. Using this curve as a base of reference, comparisons are being made with data from the Athens College, Alabama, experiments to determine the magnitude of influence of certain variables that are believed to be contributing to the reduction in growth. The final result of this analysis will be a multiple regression equation that considers the following variables: number of dead plants, regeneration, dry matter weight, nutrient levels, and radiated energy. Outside of studies dealing with the water hyacinth's physiology, there is very little quantitative information that indicates its reaction to varying environmental conditions. There still exists a need for some additional basic laboratory experiments to augment data from the Athens-Redstone experiments. (See also W73-10951) (Jones-Wisconsin)
W73-10958

AQUATIC PLANT CONTROL RESEARCH PROJECT PLAN FY 73-77 (PPB REPORT),
Corps of Engineers, Washington, D.C.
E. O. Gangstad.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p B3-B12, 1972.

Descriptors: *Aquatic weed control, *Project planning, *Project purposes, *Project benefits, *Inland waterways, Eutrophication, Aquatic plants, Planning, Control, Rivers and Harbors Act, Conservation, Legislation, Environment, Research and development, Herbicides, Harvesting, Mechanical equipment, Insects, Forage fish, Estimated costs, Plant diseases.
Identifiers: Eradication, Laser, Plant utilization, Plant pathogens.

The Army Corps of Engineers' project titled 'Integrated Mechanical, Chemical, and Biological Control Systems for Aquatic Plants' is described fully. Under 'Problem Requiring Research' are listed obnoxious plants in coastal and inland waterways, statement of the problem, present procedures and possible improvement. Under 'Impacts' are listed an impact matrix, research and plan schedule, surveys, sequence of tasks, work accomplished by others, controlled-release herbicides, control by laser, plant utilization, mechanical harvest, aquatic plant insects, aquatic plant pathogens, herbivorous fish, execution capability, and resources required. Under 'Estimated Magnitude of Payoff' various control methods are described, cost estimates and man-years are presented for 1973-1977, significant dates in project scheduling, progress and accomplishments through 1972, and alternative funding schedules. (See also W73-10951) (Auen-Wisconsin)
W73-10959

INTEGRATION OF BIOLOGICAL AND CHEMICAL CONTROL OF ALLIGATOR WEED,
Agriculture Research Center, Fort Lauderdale, Fla.
R. D. Blackburn, and W. C. Durden.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p C3-C17, 1972. 2 fig, 3 tab.

Descriptors: *Biocontrol, *Integrated control measures, *Alligatorweed, *Aquatic weed control, Herbicides, Plant growth, Insects, Georgia, 2-4-D, Diquat, Florida, Laboratory tests, Chemcontrol, Rates of application.
Identifiers: Agasicles, Savannah (Ga), Jacksonville (Fla).

It has been demonstrated that the alligator weed flea beetle (Agasicles sp.) can severely damage the surface stems of floating alligator weed mats but it alone cannot completely control floating mats because it cannot feed on the submerged stems. Constant pressure must be applied on the surface vegetation to prevent carbohydrate buildup in subsurface stems. Field observations indicated low rates of herbicides, used in combination with beetles, can result in more severe and longer lasting damage to floating alligator weed mats than is attainable with either agent alone. Growth pool and field experiments were initiated to determine if there was a preference by the flea beetle for alligator weed treated with herbicides, and the effectiveness of the beetle on alligator weed with and without herbicidal treatment. Application of herbicides, followed by introduction of beetles in the fall, resulted in reduction of surface alligator weed in drainage ditches. Spring application of herbicides suppressed alligator weeds for approximately four weeks. The ideal method of controlling alligator weed in late summer or early fall would be by treatment with a light herbicide application, insect damage on regrowth, and frost killing of regrowth. (See also W73-10951) (Jones-Wisconsin)
W73-10960

AQUATIC PLANT PROBLEMS IN LOUISIANA,
Army Engineer District, New Orleans, La.
W. E. Thompson.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p D3-D10, 1972.

Descriptors: *Water hyacinth, *Alligatorweed, *Louisiana, Aquatic weeds, Dispersion, Distribution.

The introduction of water hyacinth and alligator weed into the United States and a general description of the plants, their growth habits, and propagation are given. By 1898 practically all of the main bayous in southern Louisiana were badly infested, some bayous becoming completely blocked making rivers and streams unsafe for navigation, a hazard to fish, public health, and drainage. To the present, the area and infestation intensity have steadily increased. Only a small percentage of water hyacinths are killed by frost in southern latitudes and indications are that the plant is becoming acclimated in its creep northward. The water hyacinth is normally quickly affected by salt water, however there are some evidence that it is becoming accustomed to moderate salinity and plants grow fairly well in brackish waters. The alligator weed has spread from the bayous up into ditches and thence into cultivated lands. Farm machinery, suction dredges, and floods have aided in its dispersal. Any degree of water hyacinth infestation must be considered a hazard due to its limitless deposition of seeds and their long viability; any area once infested must be regarded as infested for a long period after the last plant has been removed. (See also W73-10951) (Auen-Wisconsin)
W73-10961

MECHANICAL HARVESTING OF WATER HYACINTH IN SHELL CREEK RESERVOIR, CHARLOTTE COUNTY, FLORIDA,
Florida State Game Freshwater Fish Commission, Eustis.
J. M. VanDyke.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p E5-E28, 1972. 3 fig, 12 tab, 11 ref.

Descriptors: *Aquatic weed control, *Mechanical equipment, *Harvesting, *Prototypes, *Water hyacinth, Reservoirs, Florida, Costs, Construction costs, Operating costs, Maintenance costs, Manpower, Operations.
Identifiers: Shell Creek Reservoir (Fla.), Sarasota Weed and Feed, Inc.

Water hyacinth's fecundity and ability to form mats and damage water quality make it the most economically and ecologically destructive aquatic weed in Florida. The study site for the prototype harvester was Shell Creek Reservoir, the municipal water supply for Punta Gorda, Florida. To reduce chemical control programs, a study was

made for removal of hyacinths by a mechanical method and development of an effective and economically feasible harvester. The harvester studied, constructed by Sarasota Weed and Feed, Inc., is a stationary, land-based system designed to remove floating aquatic vegetation, specifically water hyacinth. Chemical data on the reservoir show that mechanical harvesting had little or no effect on the water quality. With improvements, the harvester's output should be greatly increased. With its log, cattails, and heavy hyacinths, Shell Creek Reservoir was a tough testing ground. All of the hyacinths were chopped, a costly and time-consuming operation. The project was manned and equipped to find the limits of the harvester, not to achieve a low cost per ton or cost per acre figure. (See also W73-10951) (Jones-Wisconsin)
W73-10962

EVALUATION OF AQUAMARINE CORPORATION MECHANICAL HARVESTER IN REMOVAL OF WATER HYACINTHS, ST. JOHNS RIVER, BLUFTON, FLA.,
Florida State Game Freshwater Fish Commission, Eustis.
L. J. Touzeau.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p E31-E37, 1972.

Descriptors: *Aquatic weed control, *Mechanical equipment, *Evaluation, Cost analysis, On-site tests, Water hyacinth, Harvesting.
Identifiers: St. Johns River (Fla,), Blufton (Fla.), Aquamarine Corp.

A mobile water hyacinth harvesting machine, designed and built by the Aquamarine Corporation of Waukesha, Wisconsin, was evaluated during its test operation at St. Johns River, Blufton, Florida. The harvester was anchored to the shore for fixed site operation and utilized an airboat to push hyacinths to the machine. The specific equipment used and potential improvements to be made are listed. The relative truck operation time estimate gives 80% as time spent hauling the weeds to the disposal site and 20% operation time spent in loading. 66% of the harvester time was not utilized due to difficulty in feeding the hyacinths to the harvester. Minimum tonnage removed averaged 20 tons per hour. Estimates of cost breakdowns for the test evaluation, operation of the machine, and supplemental equipment are included. (See also W73-10951) (Auen-Wisconsin)
W73-10963

3C. Use of Water of Impaired Quality

CHLORIDE BALANCE OF SOME FARMED AND FORESTED CATCHMENTS IN SOUTHWESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia).
For primary bibliographic entry see Field 02K.
W73-10669

SALINE AND ORGANIC WATER POLLUTION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
H. L. Bohn, and G. V. Johnson.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 209-220, 1972. 11 ref.

Descriptors: *Water pollution, *Saline water, *Organic matter, *Water utilization, *Recycling, Freshwater, Recharge, Oceans, Reclamation, Desalination, Food abundance, Water supply, Nutrients, Wastes, Soils, Plants, Treatment.

Better use and recycling of fresh water, which often recharges the oceans, would reduce man's disruption of nature to increase his supply of potable water. The global distribution of water, desalination, water reclamation and recycling, the roles of soils and plants in recycling and urban misuse of water are discussed. Man can increase his supply of food and good fresh water by recycling and nutrient balance, which imply living off his wastes. Intimate involvement of soils and plants in the production of fresh water and food is clear. Soils and plants should be equally involved in converting our waste water into potable water and useful nutrients. Numerous examples of how this may be done and how it is being done are presented. (See also W73-10818) (Popkin-Arizona)
W73-10833

COLLECTIVE UTILITY OF EXCHANGING TREATED SEWAGE EFFLUENT FOR IRRIGATION AND MINING WATER,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
S. C. Ko, and L. Duckstein.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 221-234, (1972). 11 ref. OWRR A-022-ARIZ (4).

Descriptors: *Sewage effluents, *Irrigation water, *Industrial water, *Groundwater mining, *Alternative planning, Water utilization, Social aspects, Economic impact, Groundwater resources, Wastes, Arizona, Economic efficiency, Model studies.

The concept of collective utility is applied to a case study of alternative water resource utilization by providing a basis for comparing alternative uses of resources from the viewpoint of aggregate welfare. The exchange of sewage effluent for groundwater used by irrigation farmers, and the exchange of sewage effluent for groundwater used by processing and milling miners in Tucson, Arizona, are given as examples. Reviewed are collective utility concepts, case problems, definitions of problems, formulation of the model, and marginal change of collective utility. The first case has a collective utility of $800,500-G, where G represents unquantifiable factors, such as the reduction in quality of living due to the odor if solid waste exchanges. The second case has a collective utility of $175,000. Since it is likely that G will be on the order of $1 million per year, the first exchange is preferable to the second. (See also W73-10818) (Popkin-Arizona)
W73-10834

3D. Conservation in Domestic and Municipal Use

AN ECONOMIC EVALUATION OF A WATER-BASED URBAN TOURIST ATTRACTION IN SAN ANTONIO, TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-10564

DEVELOPMENT OF DESIGN STORM HYETOGRAPHS FOR CINCINNATI, OHIO,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02B.
W73-10679

THE METROPOLIS RUNS DRY,
Massachusetts Univ., Boston. Dept. of Political Science.
For primary bibliographic entry see Field 06E.
W73-10686

RAW WATER TRANSMISSION SYSTEM FOR SPRINGFIELD, MASS.,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 08A.
W73-10687

SOCIAL AND ECONOMIC IMPLICATIONS OF PROPOSALS FOR OUT-OF-BASIN RIVER DIVERSIONS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-10688

EVALUATION OF THE OHIO WATER SUPPLY PROGRAM: SUMMARY.
Environmental Protection Agency, Chicago, Ill. Div. of Air and Water Programs.
For primary bibliographic entry see Field 05G.
W73-10692

TOWN OF CAIRO WATER SUPPLY REPORT.
Diachishn (A.) and Associates.

Available from the National Technical Information Service as PB-214 025, $3.75 in paper copy, $0.95 in microfiche. Prepared for Greene County Planning Department, Cairo, New York, August, 1972. Report No GCPD 3-lb. 30 p, 4 fig, 4 tab. HUD Grant N. Y. P. 246.

Descriptors: *Planning, *Water supply, Water demand, Land use, Water sources, *New York, *Water districts, *Comprehensive planning, *Cities.
Identifiers: *Cairo (New York), Water supply system improvements.

A general planning study for future water supply for the Town of Cairo in New York State is presented. This report and a companion wastewater collection and disposal study are integral parts of the town's comprehensive plan. It is felt that water supply and sewerage systems are very important not only for the growth of the town but also to control the location and density of urban land use. The report covers the expected population growth in the area, future water supply demands up to the year 2020, potential sources of water supply, i.e. groundwater and small impoundments, the existing water supply system, and a master plan for additions and improvements to this system. It is recommended that a water district be established and that it purchase the existing water supply system and implement the master plan. (Elfers-North Carolina)
W73-10693

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-10726

HISTORICAL, POLITICAL AND SOCIAL FACTORS AFFECTING PUBLIC POLICY ON RIVER DIVERSION: OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO THE BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst.
E. R. Kaynor.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix A, 55 p. OWRR C-2169 (No. 3377) (1).

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Descriptors: *Diversion, *Attitudes, *Decision making, *Social impact, *Political aspects, *Connecticut River, *Massachusetts, Planning, Water supply, Pumped storage, Flood flow, Environmental effects, Riparian rights, Multiple-purpose reservoir, Nuclear powerplants, Local government, Institutions, Inter-basin transfers.
Identifiers: *Boston, Springfield (Mass.), Quabbin Reservoir, Northfield Mountain, Swift River, Chicopee River, Minimum flow, Public protest.

Response of Connecticut River valley citizens and officials to the proposed diversion of Connecticut River flood waters into Quabbin Reservoir is described. Opposition, while apparently broadly-based, was in fact attributable to a small constituency of activists. Opponents of diversion were more knowledgeable, better educated, younger, and more highly motivated than proponents. Opposition centered in the Springfield area, but was not evident further downstream in the state of Connecticut. Opponents were generally mistrustful of government, and those declaring themselves neutral tended in fact to be opposed. While officials favored diversion more than citizens, elected officials were disproportionately neutral. Political party affiliation had no bearing on this issue. Occupation was the most clearcut, apparent determinant of one's position. Reasons for opposition were most frequently related to the precedent set for future diversions of larger scope, alleged harmful environmental consequences, and failure of the Metropolitan District Commission to seek other alternatives. Opposition to the diversion proposal was effective in delaying its official approval but not in changing the proposal itself in any significant particular. Effectiveness of opposition might have been greater had opponents taken a more low-toned, factual approach giving more credence to the rational points made by the proposal's supporters. (See also W73-10726).
W73-10727

3E. Conservation in Industry

POTENTIALS FOR A DELAWARE DEEPWATER PORT.
Gladstone Associates, Washington, D.C.

Prepared for the Delaware State Planning Office, Dover, October, 1970. 129 p, 23 fig, 38 tab, 44 ref, 4 append.

Descriptors: *Economic feasibility, *Marketing, Environmental effects, Shorelines, *Delaware, *Water uses.
Identifiers: *Deepwater port, *Delaware Bay, Shoreland development.

This analysis of market potentials for a deepwater port (to handle supertankers) in the lower Delaware Bay is predominantly economically oriented and thus does not cover factors such as environmental impacts, design criteria, and state regulatory policy. The emphasis is on which industries and/or economic goods would take advantage of the deepwater port. Petroleum and iron ore are seen to have a high potential use of the port facility while coal, grain, and forest products would have low potentials. Some of the conclusions include: (1) probably only one deepwater port will be built on the East Coast in the 1970's; (2) the Delaware Bay is as advantageous a site as any on the East Coast; (3) on-shore development is not necessary for the operation of the port but petroleum and iron ore related industries are likely to be attracted; (4) private sector savings from the use of such a port should be substantial; and (5) public sector costs and benefits must be calculated also to determine the desirability of the port and the specific location. (Elfers-North Carolina)
W73-10690

3F. Conservation in Agriculture

TECHNICAL, ECONOMIC AND LEGAL ASPECTS INVOLVED IN THE EXCHANGE OF SEWAGE EFFLUENT FOR IRRIGATION WATER FOR MUNICIPAL USE, CASE STUDY - CITY OF TUCSON,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 05D.
W73-10402

INVESTIGATION OF NATURAL SEALING EFFECTS IN IRRIGATION CANALS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-10404

ANALYSIS OF WATER CONSUMPTION OF VARIOUS GRAPE CULTIVARS,
Levi Eshkol School of Agriculture, Jerusalem (Israel).
For primary bibliographic entry see Field 02D.
W73-10440

CONSTRAINTS IN WATER MANAGEMENT ON AGRICULTURAL LANDS,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. E. Radosevich, E. C. Vlachos, and G. V. Skogerboe.
Water Resources Bulletin, Vol 9, No 2, p 352-359, April 1973.

Descriptors: *Water management (Applied), *Irrigation, *Administration, *Social aspects, *Water law, *Water policy, Irrigation practices, Irrigation districts, Social values, Return flow, Water rights, Water quality control, Constraints.

Whether the goal is minimizing water quality degradation in receiving streams or maximizing agricultural production on existing croplands, the solutions are identical--improved water management practices. Technology has succeeded in developing feasible solutions to improvement of irrigation water management, but the law has been slow to direct or encourage implementation. The culprit of the western United States water problem is the property right concept of the appropriation doctrine. The most substantial impact in solving the legal and other institutional constraints inherent in the appropriation doctrine would be more stringent application of the beneficial use concept. Moreover, water quality should be made a part of each water right, the appurtenancy concept, which ties water to land, should be eliminated, and water laws should be modified to encourage the renting, leasing, transferring or selling of water rights to other uses and places so long as the vested rights of others are protected. Improving water management also implies organizational improvements such as increasing project irrigation efficiency and effectiveness through consolidation of fragmented irrigation and drainage districts into valley-wide single management units. All attempts for modifying water use must be guided by a pervasive spirit of social consciousness. (Bell-Cornell)
W73-10621

TWO-AND THREE-DIMENSIONAL INFILTRATION: SEEPAGE FROM IRRIGATION CHANNELS AND INFILTROMETER RINGS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 04A.
W73-10626

VARIABLE RESISTANCE TO WATER TRANSPORT IN LEAF TISSUE OF KALE,
Ceskoslovenska Akedemie Ved, Prague. Ustav Experimentalni Botaniky.
J. Pospisilova.
Biol Plant (Prague). Vol 14, No 4, p 293-296, 1972. Illus.
Identifiers: *Kale, Leaf tissue, *Water transport (Plants), Water potential.

The constant values of water potential gradient accompanying various levels of water flow rate were found in kale leaf tissue segments. This constancy was an indicator of the decrease of resistance to water flow as flow rate increased.--Copyright 1973, Biological Abstracts, Inc.
W73-10627

RICE GROWING IN DEEP WATER IN MALI,
J. M. Bidaux.
Agron Trop Ser Riz Rizic Cult Vivrieres Trop. Vol 26, No 10, p 1100-1114, 1971. Illus. English summary.
Identifiers: Drought, Fertilizers, Insect, *Mali, Pests, *Rice growing, Weeds.

High rice-fields where flooding does not exceed 1 m and low rice-fields where it ranges from 1 m to 3 m are distinguished. The rate of water rise can be higher than 10 cm/day at the beginning of flooding, it is about 3 cm/day towards the end of the rising period. Farmers sow in July after one or more plowings from March-April and rice is grown as rainfed rice till the flood occurs. The limiting factors of this rice-growing method are: drought, weeds, insect pests, inadequate fertilizers and late harvests.--Copyright 1973, Biological Abstracts, Inc.
W73-10628

COMSUMPTION OF WATER AND FREQUENCY OF IRRIGATION IN RADISH (RAPHANUS SATIVUS L.), BY NEUTRON MODERATION METHOD IN SOIL MOISTURE DETERMINATIONS, (IN PORTUGUESE),
Instituto Agronomico, Campinas (Brazil).
J. B. I. Dematte, M. E. S. P. Dematte, and T. Igue.
Bragantia. Vol 30, No 1, p 21-25, 1971. Illus. English summary.
Identifiers: Frequency, Irrigation, *Radish, Raphanus-Sativus, *Soil moisture, Water utilization, Neutron moderation method.

The highest average soil moisture was between 15-18 days after germination, with 5.6 mm, while the lowest was 20-23 days after germination, with 3.6 mm. The irrigation frequency was 4 days.--Copyright 1973, Biological Abstracts, Inc.
W73-10629

THE EFFECT OF POTASSIUM ON THE WATER REGIME OF THE COTTON PLANT, (IN AZERBAIJAMIAN),
A. B. Godzhamanov.
Izv Akad Nauk Az SSR Ser Biol Nauk. No 4, p 74-79, 1971. Illus. English summary.
Identifiers: Cell sap, *Cotton plants, Osmotic pressure, *Potassium fertilizer, Pressure, Fertilizers.

K fertilizers exerted a positive effect on water regime of the cotton plant with an increase in water-retaining capacity of leaves by 4.3-5.5% observed. K fertilizers significantly decreased the residual (o.81-1.83% moist weight) as well as the daily moisture deficit (by 1.75-3.97%) in different developmental phases. K promoted the increase of cell sap concentration by 0.34-2.11% and, correspondingly, the osmotic pressure of cell sap by 0.99-2.63 atm in comparison with the control.--Copyright 1973, Biological Abstracts, Inc.
W73-10633

AGROMETEOROLOGICAL INDICATORS OF THE MAIZE DEVELOPMENT IN THE REPRODUCTION PERIOD, (IN BULGARIAN),
Maize Research Inst., Knezha (Bulgaria).
N. Slavov.
Rasteniev''d Nauki. Vol 9, No 1, p 3-11, 1972. Illus. English summary.
Identifiers: Equations, Indicators (Agrometeorological), *Maize, Soil moisture, *Reproduction, Air temperature, *Air moisture.

A direct relationship exists between the length of the tasseling--silking initiation and air temperature and an inverse relationship between this period and soil moisture. An inverse relationship was observed between the length of the silking initiation--milking subperiod and air temperature. The length of the milking--dough maturity subperiod was closely related to the effective temperature. The length of the dough--full ripeness subperiod depends on the mean daily deficits of air moisture. Equations are presented for these relationships.--Copyright 1973, Biological Abstracts, Inc.
W73-10635

ON THE WATER CONSUMPTION OF WHEAT GROWN IN THE REGION OF PAZARDJIK IRRIGATION SYSTEM, (IN BULGARIAN),
Institute of Water Engineering and Land Improvement, Sofia (Bulgaria).
Y. Delibaltov.
Rastenievd Nauki, Vol 9, No 3, p 47-63, 1972. Illus. English summary.
Identifiers: *Bulgaria (Pazardjik), Fertilizers, Growth, Irrigation, *Wheat, Yield, Water requirements (Plants).

The water consumption of 'San Pastore' winter wheat grown on Bulgarian cinnamonic forest soils was determined. The field experimentation consisted of the following variants: no irrigation; pre-, or post-seeding irrigation; pre-, or post-seeding and irrigation to maintain the soil moisture during the sowing-jointing, jointing-milk stage and milk stage-harvest subperiods at 70% of the field moisture capacity (fmc) respectively; pre-, or post-seeding and irrigations for maintaining soil moisture of 70-80-70% of fmc during the respective subperiods, given in the third variant, and irrigation merely during the cropgrowing season for maintenance of the same soil moisture in the respective subperiods as in the fourth variant. The water requirements of wheat at maintenance of soil moisture of 70-80-70% of fmc varied between 4100 and 5660 cu m/ha for the 8-yr period 1962-1969. The water consumption for the jointing-heading and heading-milk stage subperiods accounted for 24 and 21.5% respectively of the consumptive use of water for the entire growing season. The daily use-rate varied widely by variants, years and periods. It is the highest during heading and milk stages reaching a peak of 52.3 cu m/ha. The maximum daily use-rate of irrigated wheat occurs 10 to 15 days later compared to unirrigated wheat. There is a close correlation between the water use for 100 kg grain produced and yield. The water consumption at different levels of fertilizing is not in a linear dependence on yield. At fertilizer levels over N100P80K60, water consumption decreases and yield increases.--Copyright 1973, Biological Abstracts, Inc.
W73-10636

THE EFFECT OF PLOWING UNDER CORN STRAW ON SOME SOIL PROPERTIES AND THE YIELD OF CORN UNDER CONDITIONS OF DRY FARMING AND IRRIGATION, (IN SERBO-CROATRAN),
Corn Inst., Belgrade (Yugoslavia).
R. Jovanovic, P. Maksimovic, and I. Franic.
Arh Poljopr Nauke. Vol 25, No 89, p 39-48, 1972. Illus. English summary.
Identifiers: Air, Compaction, *Corn, *Dry farming, Irrigation, *Plowing, Soils, Straw (Corn), Yield.

Two factorial trials were set up according to the split-plot scheme in the following combinations: (a) corn straw removed, (b) corn straw plowed under. The 4 line hybrid 'Zemun Polje 755' was used. Plowing was done in Oct. to a depth of 30 cm. Soil samples were taken directly after the autumn plowing, in the spring during the first 10 days of April and after harvesting the corn during the second half of Oct. After 3 yr the soil in which corn straw was plowed under had a compactness of 0.060 g/cm3 during the first, 0.087 g/cm3 during the second, and 0.060 g/cm3 during the third measurement. The soil from which the corn straw had been removed between the first and second measurement had a 0.13 g/cm3 increase in compactness. With irrigation the difference in soil compactness in 1966-1967 was 0.06 g/cm3 between the first and second measurement and 0.18 g/cm3 between the first and third measurement. In 1968 the difference in soil compactness was 0.08 g/cm3 between the first and second and 0.19 g/cm3 between the first and third measurement. With dry farming, the combination in which the corn straw was plowed under had a 0.453 volume% air capacity increase during the first, a 0.470 volume% increase during the second and 0.364 volume% increase during the third measurement. Under conditions of irrigation and due to plowing under the corn straw, a higher yield of corn was obtained. Under conditions of dry farming and due to the effect of plowing under the corn straw, a higher yield of kernel was also obtained.--Copyright 1973, Biological Abstracts, Inc.
W73-10637

WATER INFILTRATION UNDER CENTER--PIVOTS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. W. Addink.
Ph. D. Dissertation, August 1972. 145 p, 36 fig, 18 tab, 53 ref. OWRR-B-039-COLO (6).

Descriptors: *Sprinkler irrigation, *Irrigation systems, *Agricultural runoff, *Rate of application, Water conservation, *Soil moisture, Pipelines, Laboratory tests, Numerical analysis, Model studies, Equations, Darcy's law, Continuity equation, *Infiltration rates, Hysteresis, Flow, Shrinkage.
Identifiers: *Center-pivots.

Because of their labor-saving advantage and ability to irrigate rolling terrain and light soils, center-pivot sprinkler systems are popular. Consisting of water pipelines suspended in the air by cables or trusses and self-propelled towers, the system slowly revolves in a circle while distributing the water by sprinklers connected above the pipelines. The literature is examined at length, then the experimental design and procedures employed in the laboratory are described. Equipment included soil separation compartments, soil drying equipment, spray bar, runoff collection containers, and tensionmeters connected to manometers to monitor soil moisture tension. The numerical simulation model provided a solution to moisture flow equations derived from Darcy's Law and continutiy, and was extended to predict conditionsbeyond those of the laboratory infiltration tests. Further extensions to calculate possible effects of shrinking and swelling are also suggested. Main conclusions drawn are that a numerical moisture-flow model can be a helpful research tool, and that nonsymmetrical application rate patterns have potential for reducing runoff 10 percent or more under center-pivot sprinkler systems. (Popkin-Arizona)
W73-10698

A BUDGETING AND LINEAR PROGRAMMING ANALYSIS OF IRRIGATION WATER VALUES IN NORTHERN WYOMING,
Wyoming Univ., Laramie. Dept. of Agricultural Economics.
T. L. Dobbs, and J. R. Owen.
Wyoming Water Resources Research Institute, Completion report, November 1972. 88 p, 9 fig, 22 tab, 40 ref. OWRR-A-001-WYO (59).

Descriptors: *Linear programming, *Irrigation water, Water balance, *Budgeting, *Wyoming, Water management (Applied), Agriculture, *Water utilization, Alfalfa, Grasses, Hay, Pastures, Model studies, Value, Water rights, Limiting factors, Hydrologic data, Water demand, Water conservation.

Wyoming became formally involved in water planning with the State Water Plan of 1967. This study provides information relating to agricultural water uses which should aid in the water planning. Irrigation water values for major drainages are estimated, and current patterns of agricultural water use are described for the study area in Wyoming. Budgeting analysis is used to estimate irrigation water which increased flood-irrigated alfalfa, grass hay and pasture. Linear programming analyses generated three solutions for two ranch models in each basin of the study area. The annual values of assumed water rights are claculated by the analysis. Estimated annual values of assumed water rights ranged from $7.76 down to $2.93 per acre foot for the two model ranches. Irrigation water was generally found to be most limiting in July. More reliance can be placed in the so-called crops-only model than in the crops-and-livestock model, because of the greater emphasis placed on collection of crop data. Regional research for Wyoming water planning relating to irrigation and industrial water demands is suggested. The assumptions of linear programming analysis are reviewed. (Popkin-Arizona)
W73-10699

AN ECONOMIC ANALYSIS OF CENTER--PIVOT SPRINKLER IRRIGATION SYSTEMS IN SOUTHEASTERN WYOMING, WITH EMPHASIS ON FINANCING ALTERNATIVES,
Wyoming Univ., Laramie. Dept. of Agricultural Economics.
T. L. Dobbs, and W. G. Wedemeyer.
Wyoming Water Resources Research Institute, Completion report, Oct. 1972. 42 p, 1 fig, 19 tab, 22 ref. OWRR-A-002-WYO (2).

Descriptors: *Economic impact, *Sprinkler irrigation, *Wyoming, *Financing, *Irrigated land, Loans, Interest rates, *Economic feasibility, Costs, Return flow, Data collections, Investment, Crop production, Potatoes, Sugar beets, Profit, Land use, Alfalfa, Corn (Field), Rotations, Risks, Sampling, Forages.
Identifiers: *Center-pivots, Cash crops.

Wyoming has experienced a rapid expansion in acreage irrigated by center-pivot sprinkler systems as a result of state supported low-interest loans. This study determines alternative sources of financing and assesses the economic feasibility of center-pivot sprinkler systems. Cost and return flows were estimated, and financial and economic data were analyzed. More than one-half of the center-pivots in use by 1971 were financed by a low-interest state loan plan. Investments in sprinkler systems for production of cash crops (potatoes, sugarbeets) can be highly profitable, and do not depend on low-interest financing for economic viability. Only under conditions of low-interest financing and relatively low-value alternative uses for land do investments in sprinklers strictly for alfalfa production become economically attractive. Profitability of sprinkler investments in corn-alfalfa rotations is influenced considerably by corn silage values and by financing utilized. Investments in sprinklers for production of forage crops are economically feasible only under particular sets of assumptions. Uncertainty issues of sampling size bias are noted. (Popkin-Arizona)
W73-10700

UNIV. OF ILL. URBANA CHAMPAIGN

THE EFFECT OF ROOT GEOMETRY ON THE YIELD OF WHEAT GROWING ON STORED WATER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research and Regional Survey.
J. B. Passioura.
Australian Journal of Agricultural Research, Vol 23, No 5, p 745-752, Sept 1972. 5 fig, 9 ref.

Descriptors: *Root development, *Crop production, *Wheat, *Soil water, *Plant growth regulators, Crop response, Soil-water-plant relationships, Droughts, Hydraulic properties, Root systems, Grains (Crops), Harvesting, Cultivation, Weight, Water supply.

It is common for wheat crops to rely heavily on stored water in drought-prone environments. Pot experiments are described which test the thesis that increasing the hydraulic resistance of the root system will increase grain yield of wheat growing entirely on stored water. One experiment measured only water use and final grain yield. The main experiment included the observation of the performance of the plant through time. Pots were weighed every week, and periodic harvests were made after sowing. Root weights were also estimated. Restricting the root system to one seminal root decreased the rate of water use during the first few weeks of growth. The larger yield of single-rooted plants was due to the larger amount of water available during the last few weeks of growth. When Gabo wheat is growing on limited stored water, the grain yield can be greatly increased by forcing the plants to rely solely on one seminal root. The single-root plants use less water before anthesis than do normal plants because they have a much larger resistance to vertical flow through the root system. The xylem of the seminal root is dominated by one large vessel whose diameter probably determines the hydraulic resistance. It is possible to breed high root resistance into existing cultivars by breeding for smaller vessels. (Popkin-Arizona)
W73-10701

ADDITIONAL WATER-RETAINING FORCES OF HARDENED TILLERING NODES OF WINTER WHEAT DURING THEIR DRYING AND FREEZING, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
G. A. Samygin, and A. Z. Livshin.
Dakl Akad Nauk SSSR Ser Biol. Vol 203, No 4, p 961-964. 1972.
Identifiers: Drying, Freezing, *Tillering nodes, *Wheat, Water retention (Plants).

During drying and freezing, large additional water-retaining forces (about 80 atm) developed only in whole winter-wheat tillering nodes with a length of the sheath part at least 1.5 cm. In further studies of the nature and conditions of occurrence of additional water-retaining forces it will be necessary to work with whole tillering nodes of approximately this size.--Copyright 1973, Biological Abstracts, Inc.
W73-10704

WATER REGIME OF SOD-BROWN SOILS AND RELATION OF TEA-LEAF YIELD TO PRECIPITATION (VODNYY REZHIM DERNOVO-BUROZEMNYKH POCHV I ZAVISIMOST' UROZHAYA CHAYNOGO LISTA OT OSADKOV),
For primary bibliographic entry see Field 02G.
W73-10776

SURVIVAL OF MAIZE BACTERIAL STALK ROT PATHOGENS IN INFECTED TISSUE UNDER DIFFERENT MOISTURE AND TEMPERATURE CONDITIONS,
Udaipur Univ. (India). Agricultural Experiment Station.
T. B. Anilkumar, and B. P. Chakravarti.
Indian Phytopathol. Vol 24, No 3, p 567-570. 1971.
Identifiers: *Bacterial stalk rot, Erwinia-carotovora, *Maize, Moisture, *Pathogens, Pseudomonas-Lapsa, Temperature.

Erwinia carotovora survived for 24, 15 and 12 wk at 10C, 20C and 30C, whereas Pseudomonas lapsa survived for 30, 18 and 18 wk respectively, under similar conditions. E. carotovora survived for 18 wk at 98% humidity (RH), 15 wk at 95% RH and 12 wk at 90% and 81% RH, while P lapsa survived for 24, 18, 15 and 18 wk respectively at these relative humidities. In infected maize stalk collected from the field, E. carotovora survived 27-36 wk and P lapsa survived 40-43 wk depending on the nature of the plant tissue infected. Survival was higher in the root portion than in the aboveground portion.--Copyright 1973, Biological Abstracts, Inc.
W73-10800

DESERT PRODUCTIVITY AND ITS DYNAMICS IN CONNECTION WITH METEOROLOGY, (IN RUSSIAN),
For primary bibliographic entry see Field 02I.
W73-10808

EFFECT OF CHEMICAL FERTILIZERS ON MAIN MORPHOLOGICAL AND PHYSIOLOGICAL FEATURES IN IRRIGATED WHEAT, (IN RUSSIAN),
Institutul de Cercetari Pentru Cereale si Plante Tehnice, Fundulea (Rumania).
L. Pirjol, I. Picu, and C. I. Milica.
An Inst Cercet Pentru Cereale Plante Teh Fundulea Ser C Amelior Genet Fiziol Tehnol Agric. 37: p 9-26. 1969 (1971). Illus. English summary.
Identifiers: *Fertilizers (Chemical), Irrigation, Morphological studies, Physiological studies, *Wheat, Yields.

'Bezostaia 1' was studied under irrigation conditions on 3 soils fertilized with P (PO, P40, P80) to which 5 increasing N rates (NO, N40, N80, N120, N160) were applied at winter plowing. Studies were then carried out using 'F 38/64,' 'F 49/64,' 'F 77/64,' 'F 246/65' and 'F 360/64' lines, and 'Bezostaia 1' and 'Capitole' planted on 3 previously differently fertilized soils (N100P50, N150P50 and N200P50). In 'Bezostaia 1' the N160P40, N80P80, N120P80 and N160P80 treatments as well as in 'F 360/64,' 'F 49/64,' 'F 246/65' fertilized with N200P50 and N150P50, proved remarkable in growth and development rate, a smaller necrosis percentage and a high metabolic activity during the whole plant vegetation period which led to a higher accumulation of nutrients and outstanding yields.--Copyright 1973, Biological Abstracts, Inc.
W73-10809

OVERHEAD IRRIGATION OF SUGAR BEET ON SILTY LOAM: THE EFFECT OF SPRINKLING AND N-MANURING ON YIELDS AND ESSENTIAL QUALITY FACTORS, (IN GERMAN),
Hohenheim Univ., Stuttgart-Hohenheim (West Germany).
K. H. Martin, and A. Kachani.
Z Acker Pflanzenbau. Vol 134, No 1, p 1-24. 1971. Illus. English summary.
Identifiers: Ash, Growth, Irrigation, Leaf, *Loam soils, Manure, Nitrogen, Roots, Silty loam, Sprinkling, *Sugar beets, Yields.

The yield of sugar beet roots with overhead irrigation at 75% of available capacity, showed only a small increase in a wet year, whereas in a year when there were a number of dry periods, increases in yield were obtained up to a maximum of 13.3%. Increased N-manuring only resulted in an increase in only 1 yr. Leaf growth showed an increase both with overhead irrigation and increased N-manuring. Sugar content showed almost no response to irrigation in the wet year but in the dry year there was an increasingly marked fall after each successive irrigation. The fall in the final sugar content at harvesting was relatively small in those cases where no irrigation was given during the last 4 wk. In all cases, increased N-manuring resulted in a decrease in sugar content. The soluble ash content was higher after every irrigation. This tendency to a higher soluble ash content was further strengthened by supplementary N-manuring. Harmful N content in 1968 was reduced in all cases, but in the dry year this reduction was only obtained under intensive irrigation, while increased N-manuring had a reverse effect. The 'corrected' sugar yield showed an improvement in both years as a result of irrigation. Compared with the non-irrigated control, however, the difference was not statistically significant.--Copyright 1973, Biological Abstracts, Inc.
W73-10810

BACTERIAL BLIGHT OF CARROT IN WISCONSIN,
Wisconsin Univ., Madison.
S. M. Saad, and E. K. Wade.
Plant Dis Rep. Vol 56, No 9, p 744-746. 1972. Illus.
Identifiers: Bacterial studies, *Blight, *Carrot, Davcus-Carota, Electron microscopy, Humidity, Relative humidity, Tests, *Wisconsin, Xanthomonas-Carotae.

Bacterial blight of carrot caused by Xanthomonas carotae was found for the first time in Wisconsin during the summer of 1971. The disease was observed on the leaves, stems, and petioles of carrots (Daucus carota), cv. 'Spartan Sweet,' grown on a muck farm in Jefferson County. The Nantes cultivar showed only a trace of infection. A high level of relative humidity (RH) of 90-100% for 48-72 hr after inoculation is necessary for the bacteria to cause infection. Typical disease symptoms appeared on the foliage within 12-15 days with severe infection developing at the end of 20 days. Electron microscope study, the Hugh-Leifson test, and other tests indicated that the bacterium was Xanthomonas.--Copyright 1973, Biological Abstracts, Inc.
W73-10812

EFFECT OF CLIMATIC FACTORS ON ALPHA, BETA, GAMMA CAROTENE AND XANTHOPHYLL CONTENT IN CORN DOUBLE HYBRIDS, (IN RUMANIAN),
Institutul de Cercetari Pentru Cereale si Plante Tehnice, Fundulea (Rumania).
O. Munteanu.
An Inst Cercet Pentru Cereale Plante Teh Fundulea Ser C Amelior Genet Fiziol Tehnol Agric. 37 p, 147-154. 1969 (1971). English summary.
Identifiers: *Carotene, Climatic factors, *Corn hybrids (Double), Light, Temperature, *Xanthophyll.

Two hundred and fifty samples of corn kernels were analyzed in 3 corn double hybrids (HD 98, HD 99 and HD 120) with a shorter growth time, grown at 9 experiment stations and in 3 hybrids (HD 261, HD 310 and HD 311) with a longer growth time. Carotenoid accumulation is to a great extent conditioned by temperature and moisture in June-July-Aug., as well as by light in June. An 18-20C temperature and balanced rainfall favors carotenoid accumulation. A temperature of over 21C and reduced rainfall hinder carotenoid accumulation. Carotenoid synthesis is promoted by intensive light in June. Xanthophyll content is stimulated by abundant rainfall in Aug.--Copyright 1973, Biological Abstracts, Inc.
W73-10856

RESISTANCE TO DROUGHT OF SOME CORN SINGLE HYBRIDS DEVELOPED AT THE ICCPT-FUNDULEA AND OF THEIR COMPONENT LINES, (IN RUMANIAN),
Institutul de Cercetari Pentru Cereale si Plante Tehnice, Fundulea (Rumania).
T. Muresan, C. I. Milica, and A. M. Juncu.

An Inst Cercet Pentru Cereale Plante Teh Fundulea Ser C Amelior Genet Fiziol Tehnol Agric. 37 p, 115-133, 1969-1971. Illus. English summary.
Identifiers: *Corn hybrids, *Drought resistance (Plants), Growth, Heterosis, *Romania.

Under conditions of optimal soil moisture the investigated single hybrids present varied heterosis effects, manifested by growth rate and accumulation, in stalk leaves, ears and roots. Differences between the lines were particularly marked in potential of drought resistance.--Copyright 1973, Biological Abstracts, Inc.
W73-10864

IRRIGABILITY CLASSIFICATION OF SOILS, (IRRIGABLE SOILS OF NEVADA).

Nevada Division of Water Resources Map S-15, 1973. 1 map, 3 tab, 2 ref.

Descriptors: *Irrigable land, *Agriculture, *Soil classification, *Nevada, Soil properties, Crops, Soil mechanics, Irrigation, Land management, Temperature, *Maps, Soil-water-plant relationships, Evaluation.

This classification which includes tables and a multicolor map, is a rating system which indicates the potential usefulness of different kinds of soil for irrigated agriculture in Nevada. It is based on both judgements of the feasibility of initial improvements such as drainage, removing stones, leveling, ripping hardpan, or removing soluble salts and alkali, and on continuing limitations for use requiring special management, such as control of salt buildup. It does not consider the present availability or lack of irrigation water. The classification is intended for general planning, rather than for location of specific fields for agriculture or for identification of specific management needs. But, it does indicate major limitations for initial improvement and major hazards to continued use. Five major classes of potential usefulness for irrigation are divided into subclasses to indicate the nature of the most outstanding use limitations. Since length of growing season is so important in determining the kinds of crops which might be grown and their economic value, the irrigability classes are subdivided again according to the freeze-free (32 deg F) season zone in which the various soils occur. (Woodard-USGS)
W73-10983

DRAINAGE COEFFICIENT FOR SURFACE DRAINAGE OF AGRICULTURAL LAND FOR DIFFERENT PARTS OF THE COUNTRY,
Soil Conservation Research, Demonstration and Training Center, Dehra Dunn (India).
S. K. Gupta, K. G. Tejwani, and R. Babu.
Irrigation and Power (India), Vol 28, No 1, p 53-60, January 1971. 8 fig, 1 tab, 6 ref.

Descriptors: *Drainage systems, *Irrigation, *Agricultural engineering, Design criteria, Methodology, Crops, Soil types, Rainfall intensity, Land use, Forecasting, Correlation analysis, Furrow drainage, Contour farming, Terracing, Land management, Foreign countries.
Identifiers: *India.

Surface drainage has great scope in India, especially in black soils and irrigated areas. Regional standards for design of the drainage systems need to be prepared for the use of field staff. For surface drainage, the main requirement is a suitable outlet. The outlet design is dependent on the 'drainage coefficient' which denotes the depth of water to be removed per day. The method of estimation involves consideration of the crops to be grown, soil cover complex numbers, rainfall intensity, and conversion of this rainfall to the runoff depth. Surface drainage from agricultural lands can be broadly grouped into three categories according to the sensitivity of crops to waterlogging, e.g., vegetables, grains, and rice require that excessive water may be drained within 6, 24, and 72 hours respectivity, so that no damage is caused to the crops by waterlogging. (Woodard-USGS)
W73-10997

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

INVESTIGATION OF NATURAL SEALING EFFECTS IN IRRIGATION CANALS,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. E. Brockway.
Available from the National Technical Information Service as PB-221 010, $3.75 in paper copy, $0.95 in microfiche. Idaho Water Resources Research Institute Completion Report, May 1973. 35 p, 10 fig, 1 tab, 65 ref. OWRR A-023-IDA (1). 14-01-001-3212.

Descriptors: *Canal seepage, Tensionmeters, *Idaho, *Seepage, Seepage control, *Hydraulic conductivity, Clays, *Irrigation canals, Loam, Soil moisture, Irrigation water, Microbial degradation.
Identifiers: Clay swelling.

Results of a three year study on the factors contributing to natural sealing of irrigation canals and reservoirs are presented. Laboratory evaluations of the effect of sedimentation, microbiological activity and soil-water chemical reactions on the hydraulic conductivity of soils were performed. Particular emphasis was on the Portneuf silt-loam soil of southern Idaho. Techniques for determining and predicting the sediment entrapment in soils from hydraulic conductivity measurements in laboratory columns are presented. Application of a method utilizing soil clay content, exchangeable sodium percentage, and total salt concentration of irrigation water to predict hydraulic conductivity is evaluated. The effect of microbiological activity in the benthic area of canals and reservoirs on seepage rates is discussed. Field tests in an operating canal to monitor soil moisture tension, soil moisture and seepage rates during an irrigation season are outlined. Long term reduction in seepage rates of canals constructed in silt-loam soils is due to the formation of an impeding layer on the canal bottom due primarily to sedimentation. Seasonal changes are predominantly affected by microbiological activity in the impeding layer.
W73-10404

LOCAL ECONOMIC IMPACT OF RESERVOIR RECREATION,
Tennessee Univ., Knoxville. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-10415

METHODOLOGICAL IMPROVEMENTS IN MEASURING ECONOMIC EFFECTS OF MULTIPURPOSE WATER RESOURCE PROJECTS.
Berger (Louis), Inc., East Orange, N.J.
For primary bibliographic entry see Field 06B.
W73-10417

GEOHYDROLOGIC RECONNAISSANCE AND STUDY PLAN FOR WATER RESOURCES INVESTIGATIONS IN THE BARODA-BROACH AREA, GUJARAT, INDIA,
Geological Survey, Washington, D.C.
P. R. Seaber.
Geological Survey open-file report, June 1972. 65 p, 10 fig, 3 tab, 8 ref.

Descriptors: *Water resources, *Hydrology, *Surface waters, *Groundwater, *Water quality, Foreign countries, Geology, Climate, Soil types, Water utilization, Irrigation, Cotton, Water supply, Streamflow, Ponds, Water wells, Groundwater recharge, Chemical analysis, Well data, Water levels, Aquifers, Rainfall, Artificial recharge, Saline water intrusion.
Identifiers: *India, Baroda-Broach area (India), Gujarat (India).

The water resources of the Baroda-Broach area, Gujarat, India, are not fully utilized at present (1972). The surface-water resources of the Narmada River basin are largely unused, but could be utilized if the proposed dam near Rajpipla is built. The average annual flow of the Narmada near Rajpipla is 38.2 billion cubic meters, and the proposed dam has a contemplated storage of 17.3 billion cubic meters. The Tapti River is tapped for 10,000 cubic meters of water per day for use in water flooding of oil-bearing formations. The present system of domestic supply from village ponds utilizes surface storage of monsoon runoff directly and indirectly in the dry season (April-June) by artificial recharge and withdrawal through dug wells. The Baroda-Broach area is underlain almost everywhere by black cotton soil derived from weathering of the Deccan trap. Cotton is the main crop. Groundwater withdrawal mainly occurs from village wells and some irrigation wells, 10 to 90 meters deep. The Gujarat Alluvium of Holocene age contains the principal groundwater system. The groundwater is fresher toward the inland hilly periphery and more saline toward the coast. The dissolved solids content of water in the Gujarat Alluvium ranges from approximately 127 to 15,600 mg/liter. (Woodard-USGS)
W73-10439

STOCHASTIC MODELS APPLIED TO OPERATION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 02A.
W73-10565

A PREDICTIVE MODEL FOR UPPER RIO--GRANDE INDEX FLOWS,
Colorado Div. of Water Resources, Denver.
A. R. Qazi, and J. A. Danielson.
Water Resources Bulletin, Vol 9, No 2, p 284-290, April 1973. 7 fig, 17 equ, 6 ref.

Descriptors: *Regression analysis, *Water delivery, *Rio Grande River, *Colorado, *New Mexico, Equations, Estimating, Scheduling, *Texas, Streamflow, Precipitation (Atmospheric), Snow, Mathematical models, Systems analysis, State jurisdiction, *Forecasting, Water distribution (Applied), Interstate compacts, Interstate commissions.
Identifiers: Annual index flows, Historic data, Conejos River, Los Pinos River, San Antonio River.

There has been considerable controversy over the distribution of the Rio Grande River water among the Upper basin states of Colorado, New Mexico, and Texas. These states formed a joint commission in 1923 to study the problem. In 1939 a compact was ratified which provided for information exchange among these states and the establishment of gaging stations on and maintenance of the existing water supply levels of the Rio Grande. By 1968, Colorado had accrued a large debit, and so the Rio Grande Compact (1970) requires the state to deliver water to New Mexico at the State line on a yearly basis. The annual index flow for the Rio Grande and Conejos Rivers must be determined at the start of each calendar year, so that delivery schedules can be determined, in adnance, that meet the compact requirements. A model developed to aid in the prediction of these index

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flows is presented. Multiple regression analysis is applied using 24 years of streamflow, precipitation, and snow water contents records. Using this historic data and the IBM 360 system, equations are developed to predict the volumetric flows for the Rio Grande, Conejos, and Los Pinos Rivers at index stations. Results of the analysis are presented in the form of one equation for each month. (Bell-Cornell)
W73-10620

TWO-AND THREE-DIMENSIONAL INFILTRATION: SEEPAGE FROM IRRIGATION CHANNELS AND INFILTROMETER RINGS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs.
J Hydrol (Amst). Vol 15, No 4, p 301-315, 1972. Illus.
Identifiers: Channels, Hydraulic, *Infiltration, Infiltrometer rings, *Irrigation channels, Laboratory tests, Pressure, Sand, *Seepage, Hydraulic conductivity.

The steady seepage rates at large times from flat-bottomed channels and channels of semicircular cross-section were determined in laboratory tank experiments using various sands. Good agreement was found with the theoretical relationships which assume the flow to be confined to a saturated region bounded by a capillary-fringe surface and to be uniform and vertical at great depths. The steady large-time seepage rates were also obtained in laboratory sand-tank experiments for the 3-dimensional cases of seepage from circular shallow ponds and hemispherical sources. These agree with relationships obtained using an electrolytic tank analogue with approximate boundary conditions assumed for the flow region. A method of analysis of large-time seepage measurements from irrigation channels and infiltrometer rings is proposed, which yields the hydraulic conductivity and pressure head at the wetting front from experiments with different size channels or rings.–Copyright 1973, Biological Abstracts, Inc.
W73-10626

GUIDELINES FOR HYDRAULIC CONSIDERATIONS IN HIGHWAY PLANNING AND LOCATION.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design.
For primary bibliographic entry see Field 08B.
W73-10657

GUIDELINES FOR HYDROLOGY.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design,
For primary bibliographic entry see Field 08B.
W73-10658

HYDROLOGICAL STUDIES OF THE UPPER PARAGUAY RIVER BASIN (PANTANAL REGION, MATO GROSSO STATE, BRAZIL),
United Nations Educational, Scientific and Cultural Organization, New York. Div. of Natural Resources Research.
For primary bibliographic entry see Field 02E.
W73-10682

THE METROPOLIS RUNS DRY,
Massachusetts Univ., Boston. Dept. of Political Science.
For primary bibliographic entry see Field 06E.
W73-10686

RAW WATER TRANSMISSION SYSTEM FOR SPRINGFIELD, MASS.,
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 08A.
W73-10687

SOCIAL AND ECONOMIC IMPLICATIONS OF PROPOSALS FOR OUT-OF-BASIN RIVER DIVERSIONS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-10688

POTENTIALS FOR A DELAWARE DEEP-WATER PORT.
Gladstone Associates, Washington, D.C.
For primary bibliographic entry see Field 03E.
W73-10690

MODEL FLOOD PLAIN ZONING ORDINANCE,
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 06F.
W73-10691

AN ANNOTATED OUTLINE OF A WATER--RESOURCES DEVELOPMENT PLAN FOR ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W73-10694

INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS AND FLOODING, LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 02E.
W73-10721

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-10726

SALINITY PROBLEMS OF IMPOUNDMENTS AND THEIR MANAGEMENT,
Agricultural Research Service Chickasha, Okla. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05G.
W73-10734

WOODY PHREATOPHYTES ALONG THE BRAZOS RIVER AND SELECTED TRIBUTARIES ABOVE POSSUM KINGDOM LAKE,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 03B.
W73-10745

AN EVALUATION OF CURRENT PRACTICES IN SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
D. G. Boyer, and C. B. Cluff.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 125-152, (1972). 3 tab, 5 fig, 15 ref. OWRR A-035-ARIZ (1).

Descriptors: *Seepage control, *Ponds, *Lakes, *Surface water, *Costs, Physiochemical properties, Infiltration rates, Plasticity, Soil amendments, Arizona, Plastics.
Identifiers: Hydrophobic chemicals, Monovalent cations.

Increased seepage control from natural and artificial waters are apparently necessary with increased frequency of construction and use of small ponds and lakes. Seepage control methods are becoming more numerous and diverse. Comparisons of effectiveness, longevity, and costs are not readily available. Control techniques used in Arizona are evaluated in terms of the above comparisons. Emphasis is placed on physiochemical methods, such as plastic, soil compaction aids, hydrophobic chemicals and monovalent cation applications. Results of field comparison tests using double-ring infiltrometers are presented. Limitation of the control products are discussed. Additional research should be undertaken to improve the technology of seepage control. (See also W73-10818) (Popkin-Arizona)
W73-10828

INPUT SPECIFICATIONS TO A STOCHASTIC DECISION MODEL,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
D. M. Clainos, L. Duckstein, and T. G. Roefs.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 291-318, (1972). 3 fig, 12 ref. OWRR A-024-ARIZ (7).

Descriptors: *Input-output analysis, *Stochastic processes, *Decision making, *Optimization, *Operations research, Regulation, Reservoir operation, Linear programming, Dynamic programming, Simulation analysis, Mathematical studies, Probability, Numerical analysis, Streamflow, Watershed management, Computer programs.

New and improved methods of determining optimal operating rules for reservoirs are progressive aspects of the past decade. Deterministic linear programming, deterministic dynamic programming, stochastic linear programming, stochastic dynamic programming and simulation are the major techniques. The use of discrete conditional dependency matrices as input to stochastic decision models is examined. Conditional probabilities that are generated are not accurate. Approximation for numerical integration is required for input in dependence matrices. The real value of transforms for highly skewed streamflows may be realized when studying watersheds in an arid region. Meaningful conditional probability dependency matrices can be constructed to obtain an optimal operating policy for a reservoir. Problems and initial assumptions in the construction of matrices, the transform relating gamma space with normal space, a new transform for highly skewed data, and the possibility of using the matrices to provide realistic inputs to a stochastic dynamic program are discussed in detail. (See also W73-10818) (Popkin-Arizona)
W73-10838

CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY,
Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W73-10881

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STUDY,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-10882

AQUATIC PLANT CONTROL PROGRAM.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Available from the National Technical Information Service as AD745 895, $3.00 in paper copy, $0.95 in microfiche. Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi. 175 p, 1972. 5 fig, 19 tab, 11 ref.

Descriptors: *Aquatic weed control, *Mechanical control, *Chemcontrol, Biocontrol, Louisiana, Mechanical equipment, Florida, Harvesting, Panama Canal, Texas, Beneficial use, Coastal marshes, Hazards, Costs, Water hyacinth, Environment, Standards, Alligatorweed, Estimated costs.
Identifiers: Jacksonville (Fla), 'Weed Witch,' Carbon dioxide laser.

Problems resulting from the spread of water hyacinth and other aquatic plants and means for their control or eradication by mechanical, chemical, and biological methods, and past, present, and ongoing research were discussed at this conference. Presentations were made on 'Mechanical equipment used for aquatic plant control in Louisiana,' 'Current investigations in the Jacksonville District concerning mechanical harvesting of obnoxious aquatic plants,' 'Aquatic plant control in the Panama Canal,' 'Aquatic plant control program in Texas,' 'Beneficial aquatic plants in coastal areas,' 'Mechanical equipment 'Weed Witch' for aquatic plant control,' 'Summary of CO2 laser-water hyacinth laboratory research,' 'Field laser,' 'Facilities of the U. S. Army Corps of Engineers, Waterways Experiment Station library;' Appendies include 'Aquatic plant control research project plan, FY-73-77,' 'Cooperative research, U. S. Department of Agriculture,' 'Aquatic plant problems in Louisiana,' 'Mechanical harvesting of water hyacinths in Florida,' and 'Summary of CO2-laser control of aquatic plants.' (See W73-10952 thru W73-10963) (Auen-Wisconsin)
W73-10951

MECHANICAL EQUIPMENT USED FOR AQUATIC PLANT CONTROL IN LOUISIANA,
Army Engineer District, New Orleans, La.
W. E. Thompson.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 5-11, 1972.

Descriptors: *Aquatic weed control, *Mechanical control, *Louisiana, Equipment, Costs, Disposal, Harvesting.

Louisiana uses several mechanical methods to control aquatic weeds in its 10,000 miles of waterways and 500,000 acres of wet lands infested with water hyacinth and alligator weed. A mechanical cropper boat has destroyed large areas of aquatic plants by piling them on banks. Drifting is frequently employed and is accomplished by driving a saw boat through the growth as close to the bank as possible and cutting the growth away from its anchorage; the floating mat is cut by the same equipment into pieces which are started downstream with the current, to salt water and destruction. To control free drifting vegetation from one stream to another and the drifting from feeder areas into main channels a system of booms and barricades located in the various waterways is utilized. A self-propelled, heavy-duty roll-crusher destroyer is also used; the vegetation is fed between its two rollers whose crushing action injures the plants precluding further growth. The saw-boat destroys growth by damaging the rhizome of water hyacinth making it incapable of propagation. Description of each method, costs, and effectiveness are described. (See also W73-10951) (Auen-Wisconsin)
W73-10952

CURRENT INVESTIGATIONS IN THE JACKSONVILLE DISTRICT CONCERNING MECHANICAL HARVESTING OF OBNOXIOUS AQUATIC PLANTS,
Army Engineer District, Jacksonville, Fla. Aquatic Plant Control Section; Florida Dept. of Natural Resources, Tallahassee; and Florida State Game and Fresh Water Fish Commission, Tallahassee.
C. F. Zeiger, L. M. Curtis, and J. W. Wood.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 13-16, 1972.

Descriptors: *Mechanical control, *Harvesting, *Aquatic weed control, Florida, Water hyacinth, Fertilizers, Pulp and paper industry, Disposal, Feeds, Soil amendments.
Identifiers: *Utilization studies, Jacksonville (Fla), St. Johns River (Fla).

The Army Engineers, Jacksonville District, Florida, has been studying mechanical harvesting of aquatic weeds in cooperation with several state agencies and industries. The utilization studies include determination of possible use as a feed or feed supplement for livestock, with procedures for the best plant preparation and feeding trials; water hyacinth as a soil amendment with a study of its benefit to soil as partial or entire substitute for chemical fertilizer; the paper-making properties of water hyacinth with estimates of the market value of pulp made from hyacinth. To date water hyacinths as feed are more acceptable than hydrilla or coastal Bermuda. Complete chemical analyses of water hyacinths and the soil amended with water hyacinths are to be made. A contract has been entered into for design of an experimental hyacinth harvester to be tested on the St. Johns River. One aspect of harvesting that could be investigated is the possibility of pumping harvested, chopped hyacinth from the harvester site to a disposal area. On a large-scale basis this would be much less expensive than trucking the plants. (See also W73-10951) (Jones-Wisconsin)
W73-10953

AQUATIC PLANT CONTROL IN THE PANAMA CANAL,
Corps of Engineers, Philadelphia, Pa. Operations Div.
R. W. Lowry.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 17, 1972.

Descriptors: Aquatic weed control, Mechanical control, Equipment, Panama Canal.

Mechanical removal of floating aquatic weeds from the Chagres River, main tributary of the Panama Canal, has proven to be successful. Huge islands of hyacinth and other noxious plants float down the river after heavy rains and are trapped by a log boom. When the boom is loaded, one end is disconnected from the bank and powerful launches pull the free end upstream and across the river. Weeds caught on the boom are pushed into a basin where a Sauerman slackline operates. The 2-ton capacity bucket picks up the weeds and dumps them high on the bank where they decay and, eventually, are sufficiently dehydrated to burn. Experiments with mechanical removal of rooted emersed aquatic plants, such as elodea, and disposal by dump barges were not particularly successful. The physical laceration of the plants tended to have a cultivating effect on regrowth and the barges did not dump well in the water. (See also W73-10951) (Auen-Wisconsin)
W73-10954

BENEFICIAL AQUATIC PLANTS IN COASTAL AREAS,
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 03B.
W73-10955

MECHANICAL EQUIPMENT 'WEED WITCH' FOR AQUATIC PLANT CONTROL,
Army Engineer Div. South Atlantic, Atlanta, Ga.
For primary bibliographic entry see Field 03B.
W73-10956

SUMMARY OF CO2 LASER-WATER HYACINTH LABORATORY RESEARCH,
Athens Coll., Ala. Dept. of Biology.
For primary bibliographic entry see Field 03B.
W73-10957

FIELD LASER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 03B.
W73-10958

AQUATIC PLANT CONTROL RESEARCH PROJECT PLAN FY 73-77 (PPB REPORT),
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 03B.
W73-10959

INTEGRATION OF BIOLOGICAL AND CHEMICAL CONTROL OF ALLIGATOR WEED,
Agriculture Research Center, Fort Lauderdale, Fla.
For primary bibliographic entry see Field 03B.
W73-10960

AQUATIC PLANT PROBLEMS IN LOUISIANA,
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 03B.
W73-10961

MECHANICAL HARVESTING OF WATER HYACINTH IN SHELL CREEK RESERVOIR, CHARLOTTE COUNTY, FLORIDA,
Florida State Game Freshwater Fish Commission, Eustis.
For primary bibliographic entry see Field 03B.
W73-10962

EVALUATION OF AQUAMARINE CORPORATION MECHANICAL HARVESTER IN REMOVAL OF WATER HYACINTHS, ST. JOHNS RIVER, BLUFTON, FLA.,
Florida State Game Freshwater Fish Commission, Eustis.
For primary bibliographic entry see Field 03B.
W73-10963

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1972.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-10980

FLOOD PLAIN INFORMATION--MEADOW CREEK, EAGLE RIVER, ALASKA.
Army Engineer District, Anchorage, Alaska.

Flood Plain Report, April 1973. 26 p, 12 fig, 12 plate, 2 tab.

Descriptors: *Floods, *Flood data, *Flood damage, *Flood frequency, *Alaska, Flood discharge, Flood forecasting, Historic floods, Flood control, Land management, Planning, Streamflow, Stream gages.
Identifiers: *Eagle River (Alaska), *Meadow Creek (Alaska), Intermediate regional flood, Standard project flood.

The portion of the community of Eagle River, Alaska, covered by this report is subject to flooding from Meadow Creek. The properties along this stream are primarily residential and have been

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moderately damaged by the flood of August 1971. A history of flooding in Eagle River is presented and areas subject to possible future floods are identified. Special emphasis is given to these floods through maps, photographs, profiles and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of loss and damage. It will also aid in the identification of other flood damage reduction techniques such as works to modify flooding and adjustments, including flood proofing. (Woodard-USGS)
W73-10981

DRAINAGE COEFFICIENT FOR SURFACE DRAINAGE OF AGRICULTURAL LAND FOR DIFFERENT PARTS OF THE COUNTRY,
Soil Conservation Research, Demonstration and Training Center, Dehra Dunn (India).
For primary bibliographic entry see Field 03F.
W73-10997

4B. Groundwater Management

EVALUATION OF TECHNIQUES FOR SELECTING SITES FOR INDUCED INFILTRATION ALONG THE ALABAMA RIVER,
Geological Survey of Alabama, University.
Leon Scarbrough, and R. E. Kidd.
Available from the National Technical Information Service as PB-220 961, $3.00 in paper copy, $0.95 in microfiche. Geological Survey of Alabama, Circular 84, 1972. 77 p, 26 fig, 75 ref. OWRR A-014-ALA (1).

Descriptors: *Infiltration, *Induced infiltration, *Hydraulic conductivity, *Electrical resistivity, *Permeability, Aquifers, Alabama, *Aerial photography, Flood plains.
Identifiers: *Alabama River (Ala), Photogeography, *Shallow aquifers.

This study includes the application of photogeologic, geophysical and auger test-drilling methods in the flood plain of the Alabama River to locate and define deposits that would be good shallow aquifers having definite potential for hydraulic connection to the river. Aerial photographs were studied to assist in locating abandoned river channels and other areas in which shallow aquifers might exist. Prospective areas were then delineated, and geophysical studies and an auger test drilling program were implemented. Refraction seismic and electrical resistivity methods were used to attempt to locate sand and/or gravel deposits. Electrical resistivity became the primary geophysical method used when experience indicated that sand and gravel deposits were more resistive than the associated clay and silt deposits. Sand, gravel and clay deposits were located and mapped with the electrical resistivity instrument. The difference in conductivity between sand and gravel is very slight; therefore, it is difficult to determine if a deposit contains only sand or if it contains sand and gravel. Abandoned channels were located and the thickness of sand and gravel bodies were determined from seismic and auger test-drilling data.
W73-10401

AN ECONOMIC MODEL OF AN AREA'S RESPONSE TO DEPLETION OF ITS WATER RESOURCES,
Kansas Water Resources Research Inst., Manhattan.
R. W. Ruppert, and G. S. Clausen.
Available from the National Technical Information Service as PB-220 962, $3.00 in paper copy, $0.95 in microfiche. Contribution No 116, December 1972, 30 p, 5 fig, 2 tab, 10 ref. OWRR A-035-KAN (1). 14-31-0001-3216.

Descriptors: Groundwater mining, *Alternative planning, Income, *Kansas, Water transfer, Model studies, Irrigation efficiency, Benefits, Alternative water use, Water utilization.
Identifiers: *Economic models, *Groundwater depletion.

Irrigation development has led many areas to depend upon mining of local groundwater for considerable proportions of their income. As groundwater depletion takes place these areas can develop alternative supplies, instigate economically advantageous transfers, or incur reductions in population and income because of migration. A conceptual economic model is presented for determining the appropriate combination of the alternatives for an area to use and the way in which the combination should be varied over time as the depletion continues. Little emphasis is placed on empirical findings for case study areas, however, some detailed work is presented on migration habits to be expected in Western Kansas.
W73-10405

GEOHYDROLOGIC RECONNAISSANCE AND STUDY PLAN FOR WATER RESOURCES INVESTIGATIONS IN THE BARODA-BROACH AREA, GUJARAT, INDIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-10439

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 2, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING,
Geological Survey, Lakewood, Colo.
G. A. Dinwiddie.
Available from NTIS, Springfield, Va 22151, USGS-474-142 Price $4.00 printed copy; $0.95 microfiche. Geological Survey Publication USGS-474-142, April 1973. 32 p, 13 fig, 1 tab, 2 ref. AEC At (29-2)-474.

Descriptors: *Hydraulics, *Water quality, *Test wells, *Wyoming, Water yield, Pumping, Drawdown, Transmissivity, Pressure head, Water analysis, Chemical analysis, Fluid mechanics, Oil industry, Groundwater recharge.
Identifiers: *Sublette County (Wyo).

Wagon Wheel Water Well No. 2 was drilled to obtain hydraulic data at the site of Project Wagon Wheel, a Plowshare Project in the Green River basin of Sublette County, Wyoming. Two intervals in the 5,200-foot hole were hydraulically tested and samples of water were obtained. Results of testing the upper interval, near the 2,300-foot level, indicate that transmissivity is about 710 gallons per day per foot, and that the static water level, after correction for density, is 99.4 feet below land surface. Water from this upper interval is fresh. Results of testing the lower interval, near the 5,000-foot level, indicate that transmissivity is about 5.4 gallons per day per foot, and that the static water level, after correction for density, is 56.4 feet below land surface. Water from this lower interval is highly saline. Pressure head increases with depth, indicating the potential for upward movement of fluid. However, the great difference in chemical quality of fluid samples collected from the two tested intervals indicates that significant vertical movement of fluid upward is unlikely in the vicinity of the well. (Woodard-USGS)
W73-10445

BEHAVIOR OF GROUNDWATER FLOW SUBJECT TO TIME-VARYING RECHARGE,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 02F.
W73-10662

MATHEMATICAL SIMULATION OF THE SUBSIDENCE OF VENICE: 1. THEORY,
Centro di Ricera IBM di Venezia (Italy).
For primary bibliographic entry see Field 02F.
W73-10663

FATE OF SUSPENDED SEDIMENT DURING BASIN RECHARGE,
Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 02J.
W73-10668

ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES.
Department of the Interior, Washington, D.C. Panel on Geothermal Energy Resources.
For primary bibliographic entry see Field 06B.
W73-10696

NOTES ON DEVELOPING GROUND WATERS,
International Water Supply Association, Montreal (Quebec).
P. O. Bourgeois.
Water and Pollution Control, Vol 110, No 10, p 24-28, October, 1972. 5 fig.

Descriptors: Groundwater, *Groundwater availability, *Groundwater recharge, Groundwater mining, Infiltration galleries, Recharge, Pollution, Septic tanks, Effluents, Chlorination, Soil filters, Surveys, *Test wells, Wells, Water wells.
Identifiers: *Horizontal wells, Cone of depression, *Record keeping, Ground water pollution, Test pumping.

Advantages in developing ground water resources over surface waters for water supply and some methods for doing so are briefly discussed. Principles of artificial recharge, induced infiltration, and ground water recirculation are given. It is emphasized that well construction should be executed properly--and that when constructed by competent conscientious experts, a well should be a work of art and engineering. Analysis of geological conditions forms the first part of a ground water development program. Test drilling and pumping, to establish actual transmissivities, individual well potential yields, and complete well field yields, is then carried out. Horizontal wells and infiltration galleries are mentioned, to which the same general hydrologic and geophysical laws apply as to vertical wells. Ground water pollution is discussed, with detergent effluents from septic tanks singled out as a major pollutant. The value of record-keeping by the individual drilling or owning a well or well field is emphasized. (Smith-NWWA)
W73-10711

GAS IN GROUND WATER.

Journal of the American Water Works Association, Vol 61, No 8, p 413-414, August, 1969.

Descriptors: Groundwater, *Methane, Gases, Hydrogen sulfide, *Explosions, Gravels, Glacial sediments, Ventilation, *Decomposing organic matter, Aeration.
Identifiers: Gas-air mixture, *Flammable gases.

A summary of gas characteristics in ground water is given in order to acquaint water utilities employees and others with its nature, origins, and hazards. Both methane and hydrogen sulfide are common flammable gases found in ground water, the latter being less dangerous because it has a distinctive odor. Examples of isolated explosions attributed to gas in ground water occurring in Michigan and New York State, as well as a possible one in Louisiana, are mentioned. The minimum concentration of methane in water sufficient to produce an explosive methane-air mixture (5-15 per cent methane in a gas-air mixture) above the water from which it evolves can be as little as 1.1 ppm at normal conditions, in poorly ventilated air spaces. Under these conditions explosions can occur in shower stalls, water treatment plants,

storage reservoirs, water tanks, and other poorly ventilated air spaces. Suffocation is another hazard of gas in ground waters. Safety measures for decreasing the hazards include aeration of the water before use, and adequate ventilation of air spaces around the well in places where the water is to be used. (Campbell-NWWA)
W73-10713

WELL OPERATION,
Madison Water Utility, Wis.
For primary bibliographic entry see Field 08A.
W73-10714

CONTROLLING FLOWING ARTESIAN WELLS,
Bureau of Reclamation, Denver, Colo. Div. of Drainage and Groundwater Engineering.
For primary bibliographic entry see Field 08A.
W73-10718

ELECTROMAGNETIC DEPTH SOUNDING EXPERIMENT ACROSS SANTA CLARA VALLEY,
California Univ., Berkeley. Dept. of Geoscience Engineering.
J. Ryu, H. F. Morrison, and S. H. Ward.
Geophysics Vol 37, No 2, p 351-374, April 1972. 25 fig, 16 ref. OWRR B-067-CAL (3). 14-31-0001-1878.

Descriptors: *Electromagnetic waves, *California, Measurement, *Remote sensing, Depth.
Identifiers: *Santa Clara Valley (California).

An electromagnetic depth sounding experiment with a horizontal loop carrying an oscillating current was carried out in Santa Clara Valley, California. The field data are interpreted in terms of the polarization parameters of the magnetic polarization ellipse. The chosen parameters are tilt-angle, ellipticity, and the modulus of wave-tilt. The electrical discontinuities deduced are in general agreement with well data and with a geologic section based on resistivity soundings. The results clearly reveal an intermediate, highly resistive layer, which is a permeable stratum for groundwater recharge. It is concluded that a portable electromagnetic sounding system, measuring only tilt-angle and ellipcity, should easily locate highly resistive gravel deposits bounded by conductive clay beds. The system is useful in those regions where it is extremely difficult to inject current into the ground.
W73-10720

ROLE OF CONNECTICUT RIVER FLOOD FLOWS IN RECHARGING GROUND-WATER FORMATIONS,
Massachusetts Univ., Amherst.
O. C. Farquhar.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area. Massachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix G, 3 p. OWRR C-2169 (No. 3377) (1).

Descriptors: *Groundwater, *Groundwater recharge, Flood flow, *Diversion, Water levels, *Aquifer systems, *Connecticut River, *Interbasin transfers.

The effect of flood water diversions from the Connecticut River on groundwater recharge is explored. An extensive system of aquifers is linked to the Connecticut River and these aquifers not only provide public water supply but also help maintain a base flow in the river. A study of the available literature on proposed diversions from the Connecticut River up to the year 2020 shows that the level of the river could be reduced from .2 ft. to 1.6 feet. This decrease in river stage would be much less in the State of Connecticut and in any case is quite small compared to daily fluctuations due to the operation of small impoundments for industrial purposes. Thus, it is concluded that the flood water diversions would have no adverse effect on the aquifers in the basin. (See also W73-10726). (Elfers - North Carolina).
W73-10733

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS,
Geological Survey, Austin, Tex.
C. A. Wilson.
Texas Water Development Board, Austin, Report 166, March 1973. 87 p, 15 fig, 7 tab, 45 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water wells, *Texas, Water yield, Pumping, Water utilization, Industries, Irrigation, Domestic water, Livestock, Water quality, Salinity, Chemical analysis, Oil industry, Brines, Water pollution sources, Groundwater recharge.
Identifiers: Coke County (Tex).

Coke County, located in semiarid west-central Texas, where large ranches, small farms, and oil production are the main bases of the economy, has a small supply of groundwater and surface water. Of the approximately 1,900 acre-feet of fresh to moderately saline groundwater used in 1968, industry used 880 acre-feet, irrigation used 210 acre-feet, and domestic supply and livestock used 820 acre-feet. All of the water for municipal supply and some of the water for industry is obtained from surface-water reservoirs. The oldest geologic units cropping out in the county are the westward-dipping Permian 'red beds'. Groundwater in the Permian rocks is usually of the calcium-magnesium and sulfate or bicarbonate type. Most of the water samples in the Permian rocks contained more than 1,000 mg/liter dissolved solids. The most favorable areas in the county where well yields exceeding 50 gpm can be expected are: (1) in the floodplain alluvium along the Colorado River; (2) the 'older alluvium' in the southwestern corner of the county; and (3) in the southeastern part of the county near Tennyson, where wells may penetrate solution openings and fractures in the dolomitic beds of the Clear Fork Group. (Woodard-USGS)
W73-10744

HYDROGEOLOGY AND ENGINEERING GEOLOGY (GIDROGEOLOGIYA I INZHENERNAYA GEOLOGIYA).
For primary bibliographic entry see Field 02F.
W73-10777

'IRON WATER' FROM WELLS: CAUSES AND PREVENTION,
Geological Survey, Austin, Tex.
M. E. Broom.
Ground Water, Vol 4, No 1, p 18-21, January, 1966. 1 fig, 5 ref.

Descriptors: Wells, *Water wells, *Groundwater, *Iron, Oxidation, Reduction (Chemical), *Texas, Hardness (Water), Stratification, Oxidation-reduction potential, Geochemistry, Domestic water, Aquifer characteristics, Zoning.
Identifiers: Iron stains.

Chemical analyses of ground-water samples taken from differing depths in a four-county area in east Texas showed a general stratification with respect to dissolved iron, pH and hardness. On the basis of this stratification the waters of the groundwater reservoir were divided into a shallow zone of oxidation, A; a deep zone of reduction, C; and an intermediate and unstable zone, B, in which waters from above and below are mixed. Groundwater from zones A and C generally is almost free of iron, whereas water from zone B generally contains objectionable amounts. This zoning is explained by recent laboratory work and theoretical data on iron in natural waters. Wells constructed to draw only from zones A or C should yield water relatively free of iron. (Campbell-NWWA)
W73-10785

EFFICIENCY OF VARIOUS METHODS OF DRILLING WELLS FOR WATER SUPPLY,
For primary bibliographic entry see Field 08A.
W73-10789

GEOHYDROLOGY,
Kennecott Copper Corp., Lexington, Mass.
A. D. Pernichele.
Mining Engineers, Vol 25, No 2, p 67-68, February, 1973. 6 ref.

Descriptors: *Mine acids, Mine drainage, *Mineral industry, Leaching, *Environmental effects, Research and development, Waste dumps, Acids, Groundwater, Resistivity, Tracers, Copper, Hydrogeology, Illinois, Wisconsin.
Identifiers: Ore bodies, Uranium.

Use of the science of geohydrology to contribute to solution of a variety of problems related to mining, such as slope stability, in situ leashing, dump leaching and land rehabilitation, is expanding rapidly. The potential for damage to groundwater and surface water resources must be routinely considered when evaluating, planning and designing projects related to mining. Laws of Illinois and Wisconsin relating to permits for mining in order to control and avoid damage to the environment are oulined. EPA studies of the effects on groundwater of in situ leaching of copper ore are given. Current research and projects in connection with environmental factors of mining are described. The emphasis for the next few years will be on analysis of environmental impact as the industry is brought under increased pressure to minimize the effects of mining on the environment. (Smith-NWWA)
W73-10790

SEISMOGRAPH AND RESISTIVITY USE IN SHALLOW GROUNDWATER SEARCH,
Layne-Northwest Co., Milwaukee, Wis.
For primary bibliographic entry see Field 08G.
W73-10793

THE HEALTH AND CARE OF WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W73-10794

DRILLING FOR WATER IN NEW ENGLAND,
Geological Survey, Montpelier, Vt.
For primary bibliographic entry see Field 08A.
W73-10796

WELL DEVELOPMENT OF SAND AND GRAVEL AQUIFERS,
For primary bibliographic entry see Field 08A.
W73-10798

GROUNDWATER WELLS SERVE MINING INDUSTRY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08A.
W73-10799

THE GROUNDWATER SUPPLY OF LITTLE CHINO VALLEY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 02F.
W73-10824

U. OF I. URBANA GEOLOGY LIBRARY

AN INVESTIGATION OF THE SESMIC WAVE PROPAGATION PROPERTIES OF A THIN UNSATURATED LAYER AS A WAVE GUIDE,
Michigan State Univ., East Lansing. Dept. of Geology.
R. C. Todd.
M. Sc Thesis, 1971. 116 p, 26 fig, 2 tab, 15 ref. OWRR B-006-MICH (4). 14-01-0001-1513.

Descriptors: *Seismic waves, *Seismology, *Earthquakes, *Michigan, *Exploration.
Identifiers: *Seismic refraction model (Three-layer), Udell experimental forest, Outwash plains, Morainal features, Michigan formation.

Three-component recording can provide information about a surface layer that would be missed in conventional vertical recording. A more accurate compressional velocity determination in the surface layer and the discovery of a surface wave related to the direct arrival resulted from analysis of the three-component data. Plots of the magnitude of particle velocity without reference to direction are useful in the interpretation of three-component seismic signals. The method is new and is potentially valuable in recognizing some seismic arrivals that might otherwise be overlooked. The surface wave discovered through the use of this method apparently has not been reported in the literature. Its propagation is linked to the wave guide properties of a relatively thin surface layer with a low velocity relative to the underlying material. It is identified on an observational basis by its elliptical particle motion and its arrival time. It can be predicted at least in a qualitative sense from the theory of seismic ray propagation. Some aspects of seismic theory related to phase changes upon reflection have been experimentally confirmed. A phase reversal occurs with reflection from a free surface and no phase change occurs with reflection from an interface with material having a higher acoustic impedance. (Richardson-Michigan State)
W73-10888

UNSTEADY FLOW TWOARD AN ARTESIAN WELL,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
Y. H. Huang.
Water Resources Research, Vol 9, No 2, p 426-433, April 1973. 6 fig, 1 tab, 7 ref. OWRR A-042-KY (2) B-002-KY (3).

Descriptors: *Finite element analysis, *Unsteady flow, *Artesian wells, *Drawdown, Hydraulic models, Computer programs, Groundwater movement, Artesian aquifers.

Unsteady drawdown around an artesian well may be calculated using a finite element method programmed for a high-speed computer. On the basis of assumptions that the well has a finite radius and that the discharge from a partially penetrating well is not uniform along the well bore, numerical solutions for various well penetrations are presented and compared with the experimental measurements from a sand model. The numerical solutions check reasonably with the experimental measurements. (Knapp-USGS)
W73-10967

EFFECT OF A WATER TABLE AQUITARD ON DRAWDOWN IN AN UNDERLYING PUMPED AQUIFER,
Nevada Univ., at Reno. Center for Water Resources Research.
R. L. Cooley, and C. M. Case.
Water Resources Research, Vol 9, No 2, p 434-447, April 1973. 5 fig, 27 ref. OWRR A-045-NEV (1).

Descriptors: *Ground water movement, *Aquitards, *Drawdown, Saturated flow, Artesian aquifers, Water yield, Unsaturated flow, Equations, Confined water, Storage coefficient.

The vertical velocity at the base of a water table aquitard having negligible compressibility may be described by a convolution integral either theoretically derived or yielded by N.S. Boulton's originally empirical 'delayed yield' theory. The derivation requires that fluid compressibility be neglected and that water be obtained from storage by instantaneous desaturation (or saturation) with a declining (or rising) water table. An expression for the delay index shows that it is a function of hydraulic conductivity, specific yield, and thickness of the aquitard. To evaluate the effect that gradual desaturation may have on flow in a water table aquitard, flow in the unsaturated zone was approximated by an analytical solution of Richards' equation assuming time invariant power law functions for change of both capillary conductivity and moisture content in the vertical. An equation was derived that shows that the length of time for which gradual desaturation could influence flow in the saturated zone is a function of the hydraulic conductivity and specific yield of the aquitard and the thickness of the capillary fringe. To investigate the effect that delayed yield could have on flow in the aquifer, analytical solutions were made for flow to a well pumping at a constant rate in a compressible aquifer overlain by a compressible water table aquitard. Comparison of results that consider delayed yield effects with those that do no suggests that the unsaturated zone has little effect on flow in the aquifer. (Knapp-USGS)
W73-10968

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1972.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-10980

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN NORTHERN ILLINOIS, 1966--1971,
Illinois State Water Survey, Urbana.
R. T. Sasman, C. R. Benson, G. I. Dzurisin, and N. E. Risk.
Circular 113, 1973. 41 p, 10 fig, 4 tab, 10 ref, append.

Descriptors: *Water levels, *Drawdown, *Deep wells, *Aquifer characteristics, *Illinois, Hydrogeology, Water utilization, Water supply, Municipal water, Industrial water, Domestic water, Pumping, Water yield, Water level fluctuations, Hydrologic data, Basic data collections, Reviews, Evaluation.
Identifiers: Northern Illinois wells, *Water level decline (Wells).

Trends in water levels and pumpage from deep wells in northern Illinois are summarized from records for the end of 1966 through 1971. The Cambrian-Ordovician aquifer is encountered at depths ranging from less than 100 feet in areas of northwestern Illinois to an average of about 500 feet below land surface at Chicago; it has an average thickness of 1,000 feet and is composed chiefly of sandstones and dolomites. During the period from 1966 through 1971, pumpage from deep wells increased to 239.0 mgd, an increase of 23.6 mgd or 11% more than the 1966 pumpage. Pumpage in the Chicago region increased to 150.7 mgd, an increase of 12.5% since 1966. This increase has resulted in excessive water-level declines in some deep wells. For the Chicago region, average annual water-level declines during the 5-year period ranged from 4 feet in Grundy County to 14 feet in Lake County and averaged about 9 feet. Water levels in 11 selected observation wells outside the Chicago region declined an average of 1 foot per year during the same period. If the distribution of pumpage remains the same and pumpage continues to increase, the principal water-yielding units of the aquifer will be partially dewatered in many areas much sooner than previously anticipated. (Woodard-USGS)
W73-10993

FORMATION OF CAVITY IN CONFINED AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W73-10996

4C. Effects on Water of Man's Non-Water Activities

THE ORIGIN, EFFECTS AND CONTROL OF TURBIDITY IN AN URBAN RECREATIONAL LAKE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W73-10406

THE INFLUENCE OF BENTHIC BARK DEPOSITS ON AQUATIC COMMUNITY AND THE QUALITY OF NATURAL WATERS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
F. D. Schaumburg, and J. Walker.
Available from the National Technical Information Service as PB-220 952, $3.00 in paper copy, $0.95 in microfiche. Final Research Report: May 1973, 24 p, 8 fig, 2 tab, 11 ref. OWRR A-012-ORE (1).

Descriptors: *Bark, Estuaries, *Lumbering, Food chains, *Benthos, *Oregon.
Identifiers: *Yaquina Bay.

The water storage and transport of logs is commonplace in the Pacific Northwest. The effect of bark deposits on the benthic ecosystem, including numerous species of macro-invertebrates, was investigated. These and other organisms are important links in the food chain for fish and shellfish which inhabit lakes, streams, and estuaries used for log storage. Based upon the results of this study, bark deposits appear to have little or no detrimental effect on the benthic macro-invertebrates which inhabit Yaquina Estuary. Under different situations such as those in which negligable water movement is available above bark deposits, the increased oxygen demand of the bark might affect the water column to the extent that a decrease in the benthic fauna would result.
W73-10411

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY,
Geological Survey, Philadelphia, Pa.
For primary bibliographic entry see Field 02L.
W73-10425

EFFECTS OF URBANIZATION OF SEDIMENTATION AND FLOODFLOWS IN COLMA CREEK BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. M. Knott.
Geological Survey open-file report, February 22, 1973. 54 p, 20 fig, 18 tab, 10 ref.

Descriptors: *Sediment transport, *Land development, *Urbanization, *California, Sediment yield, Floods, Streamflow, Hydrologic data, Data collections, Stream gages, Sampling, Suspended solids, Sedimentation, Correlation analysis, Environmental effects, Geology, Topography, Vegetation, Land use, Rainfall-runoff relationships.
Identifiers: *Colma Creek basin (Calif.).

Some of the changes are described in water and sediment discharge that occurred in the Colma Creek basin in California during a period of major urban expansion. Hydrologic data collected from 1964 to 1971 were used to evaluate trends and relations between sediment yield and land use. Total

sediment yield upstream from the Colma Creek gaging stations ranged from 3,400 to 14,000 tons per square mile during 1966-70. Sediment discharge rates of Spruce at South San Francisco were relatively stable in 1966-67, but increased sharply in 1968 and 1969 owing to increased construction activity and to sediment losses from a debris basin which was breached several times during large storms. Annual suspended-sediment yield upstream from the Spruce Branch gaging station ranged from 2,800 to 39,000 tons per square mile during the period 1966-69. Future sediment yields of the Colma Creek basin will undoubtedly be lower than yields observed during the study period when construction activity was high. If the basin becomes completely urbanized (65% urban and 35% open space), it is probable that sediment yields for the entire basin will range from 9,700 tons in a year of average rainfall to 25,000 tons in a year of extremely high rainfall. (Woodard-USGS)
W73-10653

GUIDELINES FOR HYDRAULIC CONSIDERATIONS IN HIGHWAY PLANNING AND LOCATION.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design.
For primary bibliographic entry see Field 08B.
W73-10657

GUIDELINES FOR HYDROLOGY.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design,
For primary bibliographic entry see Field 08B.
W73-10658

UNDERGROUND CORROSION AND SALT INFILTRATION,
Connecticut Univ., Storrs, Dept. of Civil Engineering.
P. M. Berthouex, and G. A. Prior.
Journal of the American Water Works Association, Vol 60, No 3, p 345-356, March, 1968. 6 fig, 27 ref.

Descriptors: Corrosion, Corrosion control, Electrolytes, *Salts, *Highway icing, Leaching, Chlorides, Calcium chloride, Sodium chloride, Resistivity, Soil chemistry, *Soil water movement.
Identifiers: Buried pipes, *Galvanic cells.

The mechanism of salt penetration into the soil and the possible effects of infiltrated salts on underground corrosion are discussed. Soil samples from an area along a main New England highway were obtained at distances of 5, 25, 50, and 100 ft. from the edge of the paved shoulder. At each of these locations soil samples were taken from the surface and at depths of 1/2, 1, 2 and 3 ft. Three snowfalls had occurred before sampling was initiated. Greatest salt concentrations were found near the highway, with the highest concentration, 450 ppm, measured at the surface 5 ft. from the pavement. In general, the salt concentration decreased with depth, and the fluctuations in salt concentration were smaller at greater depths. Infiltrated salts will decrease the soil resistivity and generally promote increases in corrosion rates. Also, the natural leaching process produces concentration differences over narrow depths which can create galvanic cell corrosion, the importance of which will depend upon the stability of the anode location. These effects are related to soil drainage. (Smith-NWWA)
W73-10712

ANNOTATED BIBLIOGRAPHY AND COMMENTS ON SEDIMENTATION IN THE CONNECTICUT RIVER,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 02J.
W73-10728

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

SPECTROGRAPHIC ANALYSIS OF METALS IN FRESHWATER SEDIMENTS,
Eastern Michigan Univ., Ypsilanti. Dept. of Chemistry.
S. W. Brewer, Jr.
Available from the National Technical Information Service as PB-220 949, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, Michigan Institute of Water Research, State University, May 1973. 38 p, 5 fig, 11 tab, 9 ref. OWRR A-056-MICH (1). 14-31-0001-3522.

Descriptors: *Spectroscopy, *Michigan, Analytical techniques.
Identifiers: *Huron River (Mich), *Atomic absorption analyses, Graphite spark technique.

Sediment samples were collected along the entire Huron River. In order to develop analytical procedures, samples from sites near Ypsilanti were selected. These samples were analyzed qualitatively by dc arc spectroscopy, and showed Al, Si, and Mg present at levels>1%, Fe present at roughly 0.1%, Mn present at < 0.1%, and Cu and Zn present at lower levels than Mn and Pb present at trace levels. Atomic absorption analyses of leach liquors from these sediments show good correspondence with the arc results for Fe, Mn, Cu, and Cr. High-voltage spark studies, using the graphite spark technique are in progress, and indicate that detection of 0.5 ppm of metal in a 0.775 ml sample of leach liquor is feasible.
W73-10407

DETERMINATION OF NANOGRAM LEVELS OF SILVER IN SUSPENDED MATERIALS OF STREAMS RETAINED BY A MEMBRANE FILTER WITH THE 'SAMPLING-BOAT' TECHNIQUE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-10429

A RAPID SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS,
Oak Ridge National Lab., Tenn.
W. W. Pitt, Jr., S. Katz, and L. H. Thacker.
Available from NTIS, Springfield, Va. 22151 as CONF-720827-2 Price $3.00 printed copy; $0.95 microfiche. Preprint presented at 73rd National Meeting of the American Institute of Chemical Engineers, August 30, 1972, Minneapolis, Minnesota: Atomic Energy Commission, Oak Ridge National Laboratory Publication, 1972. 20 p, 7 fig, 2 tab, 1 append.

Descriptors: *Chemical analysis, *Water analysis, *Chemical oxygen demand, *Pollutant identification, *Fluorometry, Methodology, Analytical techniques, Correlation analysis.

A rapid, sensitive cerate oxidative method for measuring the chemical oxygen demand (COD) of waters is described. The pollutants are oxidized with perchlorato-cerate reagent and the resulting cerium (III) is determined fluorometrically. Analysis requires only a few minutes for determinations at levels as low as 100 micrograms of oxygen demand per liter. Results of tests on solutions of known organic compounds, various industrial waste streams, and natural waters show that the method compares favorably with the dichromate reflux procedure recommended by APHA. However, the new method is considerably faster and easier to use, and is a hundred times more sensitive. An analytical system which is suitable for use as either a continuous COD monitor or as an analyzer for multiple samples in series is described also. (Woodard-USGS)
W73-10434

THE DETERMINATION OF VANDIUM IN BRINES BY ATOMIC ABSORPTION SPECTROSCOPY,
Geological Survey, Washington, D.C.
H. J. Crump-Wiesner, H. R. Feltz, and W. C. Purdy.
Analytica Chimica Acta, Vol 55, p 29-36, 1971. 2 fig, 2 tab, 14 ref.

Descriptors: *Chemical analysis, *Trace elements, *Brines, *Analytical techniques, Metals, Spectrophotometry, Water chemistry, Spectroscopy, Methodology, Laboratory tests.
Identifiers: *Vanadium determinations, Triisooctyl thiophosphate, Methyl isobutyl ketone.

A standard addition method is described for the determination of vanadium in brines by atomic absorption spectroscopy with nitrous oxide-acetylene flame. Sample pH is adjusted to 1.0 with concentrated hydrochloric acid and the vanadium is directly extracted with 5% cupferron in methyl isobutyl ketone (MIBK). The ketone layer is then aspirated into the flame and the recorded absorption values are plotted as a function of the concentration of the added metal. As little as 2.5 micrograms/liter of vanadium can be detected under the conditions of the procedure. Tungsten and tin interfere when present in excess of 5 and 10 micrograms/liter, respectively. The concentrations of the two interfering ions normally found in brines are well below interference levels. (Woodard-USGS)
W73-10442

MERCURY POLLUTION AND LAKE ERIE FISHES,
Michigan State Univ., East Lansing.
C. S. Annett, M. P. Fadow, F. M. D'itri, and M. E. Stephenson.
Michigan Academician, Vol 4, No 3, p 325-337, Winter 1972. 3 fig, 2 tab, 26 ref.

Descriptors: Water pollution sources, *Mercury, *Lake Erie, *Fish, *Sediments, Chemical analysis, Analytical techniques, Pollutant identification, Industrial wastes, Aquatic environment.

Various sources of mercury contribute to the mercury contamination of Lake Erie in the vicinity of the Raisin River. To assess their extent, 79 fish and 37 sediment samples collected from this area of Lake Erie during the fall season of 1970 were analyzed by flameless atomic spectrophotometric techniques. The average concentration of total mercury in the muscle tissue of several species of fish ranged from 0.06 to 1.7 ppm on a wet weight basis, and total mercury concentrations in the sediments ranged from 0.19 to 0.53 ppm on a dry weight basis. No relationship appears to exist between the size of the fish and its total mercury content within a given species. However, a trend in mercury accumulation can be distinguished among species. The mean total of mercury levels has a declining order in perch, goldfish, and carp with values of 0.49, 0.28, and 0.19 ppm of mercury, respectively. (Woodard-USGS)
W73-10444

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass.
O. Zafiriou, M. Blumer, and J. Myers.
Available from the National Technical Information Service as PB-211 337, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. WHOI-72-55, July 1972. 101 p, 5 fig, 11 tab, 5 append. Contract No. EPA 15080 HEC.

U. OF ILL. URBANA CHAMPAIGN

Descriptors: *Oil pollution, *Chemical analysis, *Pollutant identification, *Oil spills, Weathering, Methodology, Oily water, Separation techniques, Water pollution, Water analysis, Gas chromatography, Monitoring, Variability, *Maine, *New York, Chemistry, Water quality, Geochemistry, Distillation, Evaporation, Oxidation, Water sampling, Bottom sampling, Sediments, Aquatic life, Solvent extractions, Benthos, Mass spectrometry.
Identifiers: *Oil characterization, *Oil fingerprinting, *Flame ionization gas chromatography, Crude oil, Chemical composition, Fuel oil, Sample storage, Sample preparation, Data interpretation, Environmental samples, Chromatographic columns, Aromatic hydrocarbons, Aliphatic hydrocarbons, Olefins, Pristane, Phytane, Dissolution, Bachaquero crude oil, Diesel oil, n-Paraffins, Column chromatography, GC-Mass spectrometry, Squalene.

Environmental samples of oil and oil products can be correlated with possible sources by comparison of their stable compositional features. Procedures for correlating samples with suspected sources by gas chromatographic analysis under standardized conditions are presented in manual form. A high rate of success for the method in realistic situations is estimated by analyses of artificially aged oils and of potential spill sources found in Greater New York Harbor and Portland, Maine. The method is suitable for routine use for weeks-old oil samples, and for monitoring levels of hydrocarbons in organisms and sediments. Slightly modified, it can be used in low-level and research work studying the fate and effects of petroleum hydrocarbons. (Holoman-Battelle)
W73-10459

ENHANCEMENT OF NET PRIMARY PRODUCTIVITY BY HERBIVORE GRAZING IN AQUATIC LABORATORY MICROCOSMS,
State Univ. of New York, Binghamton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-10460

DIURNAL PERIODICITY IN THE PHYTOPLANKTON ASSEMBLAGE OF A HIGH MOUNTAIN LAKE,
Innsbruck Univ. (Austria). Inst. of Zoology.
For primary bibliographic entry see Field 05C.
W73-10461

ANALYSES OF DREDGED WASTES, FLY ASH, AND WASTE CHEMICALS - NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross.
Available from the National Technical National Information Service as AD-734 337, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 7, October 1970. 33 p, 8 fig, 8 tab, 21 ref. Contract No. DACW-72-70-C0009.

Descriptors: *Sediments, *Heavy metals, *Oxidation-reduction potential, *Chemical analysis, *Sewage sludge, *Chemical wastes, Carbon, Cobalt, Chronium, Cooper, Manganese, Nickel, Lead, Zinc, Titanium, Aluminum, Iron, Magnesium, Calcium, Sodium, Potassium, Tracers, Waste identification, *New York, Industrial wastes, Fermentation, Distribution patterns, Water pollution effects.
Identifiers: Characterization, *Pharmaceutical wastes, *Fly ash, Silver, Boron, Barium, Tin, Vanadium, Silicon.

A study of solid wastes commonly dumped in the ocean near New York Harbor was designed to obtain information on the physical and chemical characteristics of the materials for use in determining types, distribution, and movement of the wastes and for controlling deleterious effects. Wastes were sampled from a wide variety of sources including sewage sludges, waste chemicals, liquid wastes, fermentation wastes, hopper dredge spoils, and fly ash. In addition deposits in the waste disposal areas were sampled. Physical properties determined were bulk density, grain density, and settling velocity. Spectrochemical analysis was used to determine Ag, B, Ba, Co, Cr, Cu, Mn, Ni, Pb, Sn, U, Zn, Si, Ti, Al, Fe, Mg, Ca, Na, K, and C. Oxidation-reduction potential was also determined. Chemical and physical properties of these wastes suggest that they commonly consist of about 20 percent carbonaceous wastes (possibly sewage solids) mixed with low-carbon river-borne silt (median grain size 30 microns) and an unknown amount of industrial wastes. Ash from coal-fired power generating plants was chemically similar to shale but contained appreciable amounts of mullite. Some samples of waste chemicals had high concentrations of such metals as Pb, Sn, and Zn. A preliminary budget of waste solids dumped in the New York Bight indicates that dredged wastes are a major source of oxygen-demanding substances and potentially troublesome metals. Certain metals, especially Ag and Pb, and the high carbon concentrations are promising as tracers in delineating distributions and subsequent movement of waste deposits in the region. (Little-Battelle)
W73-10462

SALMONELLAE AND EDWARDSIELLA TARDA IN GULL FECES: A SOURCE OF CONTAMINATION IN FISH PROCESSING PLANTS,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-10463

THE APPLICATION OF MULTI-ATTRIBUTE SCALING PROCEDURES TO THE DEVELOPMENT OF INDICES OF VALUE,
Michigan Univ., Ann Arbor. Engineering Psychology Lab.
M. F. O'Connor.
Available from the National Technical Information Service as AD-746 155, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 037230-1-T, June 1, 1972. 152 p, 23 fig, 16 tab, 3 append. Project No. NR 197-014. Contract No. N00014-67-A-0181-0034.

Descriptors: *Water quality, *Mathematical models, Phenols, Dissolved oxygen, Dissolved solids, Hydrogen ion concentration, Fluorides, Hardness (Water), Nitrates, Chlorides, Alkalinity, Turbidity, Color, Sulfates, Temperature, Ammonia, Phosphates, Mathematical studies, Coliforms.
Identifiers: *Water quality index, *Data interpretation, Fecal coliforms.

Multi-attribute scaling procedures were used to develop water quality indices for waters to be used for human consumption and for support of fish and wildlife. Scaling procedures were applied to this task by assessing, from water quality engineers, (1) judgements about which variables should be included in the index, (2) the type of rule for combining the variables, (3) the relative importance weights of the different variables, and (4) a curve describing the functional relation between water quality and each variable. A modified Delphi procedure was used for obtaining concensus among the engineers for each of the indices. Even after the applications of the Delphi procedure, the engineers disagreed on the importance weights, so a sensitivity analysis applied the different indices to actual measurements on samples of river water. This analysis indicated that the disagreement about the weights was not crucial to the measurement of water quality. The parameters considered as indicators of water quality were: fecal coliforms, phenols, DO, dissolved solids, pH, fluorides, Hardness, nitrates, chlorides, alkalinity, turbidity, color, sulfates, temperature, ammonia, and phosphates. An additive equation was used to combine the chosen parameters into a water quality index. (Little-Battelle)
W73-10464

OIL/WATER INTERFACE DETECTOR,
Esso Research and Engineering Co., Florham Park, N.J.
J. O. Moreau.
Available from the National Technical Information Service as COM-72-11295, $3.00 in paper copy, $0.95 in microfiche. Final Report No. EE.4TMR.72, December 1971. 99 p, 7 ref, 3 append. Project No. Task II, Sub-Task I. Contract No. C-1-35049.

Descriptors: *Oil-water interfaces, *Oily water, *Electrical equipment, Pollutant identification, Costs, Oil, Oil pollution, Water pollution sources, On-site investigations, Monitoring, Electronic equipment.
Identifiers: *Detectors, *Detection limits, On board analysis, Sensors.

A survey of manufacturers was conducted to find all equipment that could differentiate between oil and water on a continuous basis and thus be used as an oil-water interface detector during tanker deballasting. Twenty-five possibly applicable devices were found. Based on manufacturers' information, these devices were evaluated in relation to shipboard conditions such as installation, safety, maintenance, and operation requirements. The device which seems best suited to ballast control applications is the Sensall 440 Series In-Line Interface Sensor which measures sonic attenuation. The Sensall would have a probe detector mounted in the discharge line and would alarm at oil concentrations well below 1 percent. Laboratory and shipboard tests would be required, however, before this device could be recommended for installation aboard ship. The NUS sonic interface detector and the Gallbrith Oil Overboard Discharge Alarm system will also merit further study if they can be modified to meet shipboard safety restrictions. (Little-Battelle)
W73-10466

MULTI-SENSOR DETECTION AND TRACKING OF CONTROLLED OIL SPILLS,
Spectran, Inc., Hollywood, Calif. Microwave Sensor Systems Div.
For primary bibliographic entry see Field 05B.
W73-10467

EFFECT OF ION PAIRING ON THE PH OF SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 02K.
W73-10469

A NEW SPECIES OF PSEUDOCODIUM (CHLOROPHYTA, SIPHONALES) FROM THE WEST COAST OF FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
C. J. Dawes, and A. C. Mathieson.
Phycologia, Vol. 11, Nos. 3/4, p 273-277, December 1972. 6 fig, 1 tab, 8 ref.

Descriptors: *Systematics, *X-ray diffraction, Distribution, *Florida, Pollutant identification, *Chlorophyta, Marine algae.
Identifiers: *Pseudocodium floridanum.

A new species of Pseudocodium (P. floridanum) is described from deep waters (37 to 55m) off the west coast of Florida. It is the third described species of Pseudocodium, and the first record of the genus from the northern hemisphere. X-ray dif-

fraction studies indicate the presence of Beta, 1-4 mannan in its cell walls. The affinities of Pseudocodium are discussed. (Little-Battelle)
W73-10470

PRELIMINARY ANALYSES OF URBAN WASTES, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
G. M. Gross.
Available from the National Technical Information Service as AD-746 959, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 5, February 6, 1970. 32 p, 5 fig, 9 tab, 8 ref. Grant No. DACW 72-70-C-0009.

Descriptors: *Sewage sludge, Pollutant identification, Methodology, *Alkali metals, *Alkaline earth metals, *Heavy metals, Industrial wastes, Chemical analysis, Soil analysis, Sedimentary rocks, Sampling, Sewage treatment, Chromium, Copper, Zinc, Pollutants, New York, Iron, Aluminum, Calcium, Magnesium, Boron, Phosphorus, Titanium, Lead, Manganese, Nickel, Molybdenum, Cadmium, Sodium, Cobalt, Potassium, Strontium, Mercury, Beryllium, Carbon, Sulfides.
Identifiers: *Rare earth elements, *Optical emission spectroscopy, Aluminosilicates, Chemical recovery, Sample storage, Sample preservation, Accuracy, Precision, Reproducibility, Loss-on-ignition procedure, Wet combustion procedure, Sample preparation, *New York Bight, Tin, Silver, Spectrochemical analysis, Carcinogens, Silicon, Barium, Bismuth, Vanadium, Zirconium, Arsenic, Antimony, Thallium, Gallium, Yttrium, Ytterbium, Cerium.

Preliminary analyses were made of 17 sewage sludge samples from sewage treatment plants serving 11.9 million persons in the New York Metropolitan Region. The sludges consist of about 55 percent organic matter, which, in turn, accounts for about 55 percent of the total oxygen demand of the sludges. About 45 percent of the sludge consists of aluminosilicate material, chemically similar to shale. The samples are enriched, compared to sedimentary rocks and soils, in the following elements: silver (150x), chromium (10x), copper (50x), tin (30x), and zinc (30x). All of these elements are common industrial materials, and are known to be highly toxic to marine organisms; some are carcinogenic. Further studies are required to determine the chemical form in which they occur in the sludges and whether they are released to organisms or to seawater after dumping or deposition of the sludges. These preliminary analyses indicate the semi-quantitative spectrochemical analyses may be useful for determining order-of-magnitude concentrations of at least 24 elements commonly occurring in sewage sludges. Other techniques are required to detect other possible pollutants, with usable precision. Loss on ignition is a useful technique to use in analysis of organic matter (Volatile matter) in sewage sludges not containing large amounts of hydrous aluminosilicates. (Holoman-Battelle)
W73-10471

GAS-LIQUID-SOLID CHROMATOGRAPHY OF FREE ACIDS,
Rome Univ. (Italy). Istituto di Chimica Analitica.
A. Di Corcia.
Analytical Chemistry, Vol. 45, No. 3, p 492-496, March 1973. 6 fig, 1 tab, 19 ref.

Descriptors: *Organic acids, *Chemical analysis, *Pollutant identification, *Separation techniques, *Molecular structure, Selectivity, Efficiencies, Chemical properties, Aromatic compounds, Organic compounds.
Identifiers: *Gas-liquid-solid chromatography, Detection limits, Gas liquid chromatography, Chromatographic columns, 2-Methylbutyric acid, Fatty acids, 3-Methylbutyric acid, Acetic acid, Propionic acid, Isobutyric acid, Butyric acid, Trimethylacetic acid, Valeric acid, Benzoic acid, o-Toluic acid, m-Toluic acid, Salicylic acid, p-Toluic acid, o-Chlorobenzoic acid, m-Chlorobenzoic acid, p-Chlorobenzoic acid, Oleic acid, m-Hydroxybenzoic acid, p-Hydroxybenzoic acid, o-Nitrobenzoic acid, Isovaleric acid, Elaidic acid.

The use of gas-liquid-solid chromatography has been extended to the elution of free acids. The coating of the graphitized carbon black, such as graphitized Sterling FT (FT-G), by means of a suitable amount of an involatile stationary phase (FFAP) makes possible the linear elution of free acids at the nanogram level. By varying the liquid/solid ratio, gas-liquid-solid (GLS) columns have been evaluated in terms of selectivity, efficiency, and time of elution for acid compounds. On these bases, GLS columns have been compared with a GL column normally used for the analysis of acids. The results confirm that the surface of the carbon is very effective in separating molecules differing mainly in their geometric structure. In addition, GLS columns retain peak broadening also at high linear carrier gas velocities. On FT-G coated with 0.3 percent FFAP, the separation of C2-C5 fatty acids, including 2-methylbutyric and 3-methylbutyric acids, in a very dilute water solution (approximately 40 ppm) has been obtained in about 1.5 minutes. The separation of the isomers of some aromatic acids also has been performed. (Holoman-Battelle)
W73-10473

DETERMINATION OF AMMONIACAL NITROGEN IN THE PRESENCE OF UREA WITH AN AMMONIA ELECTRODE,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Chemical Development.
T. C. Woodis, Jr., and J. M. Cummings, Jr.
Journal of the Association of Official Analytical Chemists, Vol. 56, No. 2, p 373-374, March 1973. 3 tab, 3 ref.

Descriptors: *Ureas, *Nitrogen, *Ammonia, Methodology, Chemical analysis, Reliability.
Identifiers: *Ammonia electrode, Ion selective electrodes, Ammonium, Accuracy, Reduced pressure distillation, Urea ammonium phosphate, Urea ammonium nitrate, Urea ammonium polyphosphate, Urea ammonium sulfate, Chemical recovery.

A recently introduced commercial electrode is shown to be suitable for the determination of ammoniacal nitrogen in the presence of urea. The results compare favorably with those of the reduced pressure distillation method. Standard deviations for the electrode method and the reduced pressure distillation method for ammoniacal nitrogen in urea ammonium phosphate are 0.12 and 0.09 percent, respectively. (Holoman-Battelle)
W73-10474

AN ANALYSIS OF FACTORS GOVERNING PRODUCTIVITY IN LAKES AND RESERVOIRS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-10475

PERSISTENCE OF PARATHION IN SIX CALIFORNIA SOILS UNDER LABORATORY CONDITIONS,
California University, Riverside, Citrus Research Center and Agricultural Experiment Station.
For primary bibliographic entry see Field 05B.
W73-10476

IRON-PHOSPHATE COMPOUND IDENTIFICATION IN SEWAGE SLUDGE RESIDUE,
Marquette Univ., Milwaukee, Wis. Coll. of Engineering.
M. A. Seitz, R. J. Riedner, S. K. Malhotra, and R. J. Kipp.
Environmental Science and Technology, Vol. 7, No. 4, p 354-357, April 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Pollutant identification, Sewage sludge, X-ray analysis, X-ray diffraction, Methodology, Separation techniques, Sewage treatment, X-rays, Pollutants.
Identifiers: *Vivianite, *X-ray powder diffraction, Sample preparation.

The iron phosphate compound, vivianite (Fe3 (Po4)2.8H20), has been identified by use of Z-ray powder diffraction techniques, as existing in the dried secondary sludge residue of the Milwaukee Jones Island sewage treatment plant. In identifying this compound, various methods of drying the sludge residue were evaluated. Magnetic separation techniques were used to concentrate and separate vivianite from the bulk of the dried material. Analysis indicated that vivianite existed in a concentration of about 1 wt percent of the dried material. (Holoman-Battelle)
W73-10478

DIRECT TITRIMETRIC MICRODETERMINATION OF FLUORODIFEN, LINURON, FANERON, AND PEBULATE,
Allahabad Agricultural Inst. (India). Dept. of Agronomy.
S. L. Abbas, A. K. Ghosh, S. A. I. Rizvi, and O. C. Saxena.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 387-389, March 1973. 1 tab.

Descriptors: *Herbicides, *Volumetric analysis, Pollutant identification, *Soil analysis, Chemical analysis, Dyes, Soil contamination, Methodology, Chemical reactions, Urea pesticides, Halogenated pesticides.
Identifiers: *Fluorodifen, *Linuron, *Faneron, *Pebulate, Chemical indicators, Chemical recovery, Bromocresol green, Catechol violet, Xylenol orange, Organic dyes, Gallium chloride, Metal complexes, Complexation, Phenylurea pesticides.

The herbicides fluorodifen, linuron, faneron, and pebulate have been determined in individual standard solutions by direct titration against gallium chloride solution, using different indicators. The same technique was applied to estimation of these herbicides in treated soils. The complex between gallium chloride and fluorodifen or linuron was formed in a 1:3 ratio, whereas the complex with faneron or pebulate was in a 1:1 ratio. Recoveries for fluorodifen, linuron, faneron, and pebulate were 99.9-101.5, 99.0-102.4, 97.1-101.3, and 98.3-101.2 percent, respectively. Treatment with herbicide lowered the pH of the soil. (Holoman-Battelle)
W73-10481

DRY ASHING TECHNIQUE FOR THE DETERMINATION OF ARSENIC IN MARINE FISH,
Beak (T.W.) Consultants, Ltd., Toronto (Ontario). Lab. Div.
P. J. Leblanch, and A. L. Jackson.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 383-386, March 1973. 6 tab, 19 ref.

Descriptors: *Colorimetry, *Marine fish, *Pollutant identification, Methodology.
Identifiers: *Arsenic, *Dry ashing, Sample preparation, Silver diethyldithiocarbamate, Chemical recovery, Precision, Detection limits.

A dry ashing procedure, followed by the silver diethyldithiocarbamate colorimetric determination of arsenic in marine fish, is presented. The sample was first homogenized and a portion pre-ashed with magnesium nitrate, using infrared heat, followed by ashing in a 500 C muffle furnace. The residue was dissolved in HCl and the arsenic reduced by means of zinc and HCl to arsine, which was complexed with AgDDC and determined colorimetrically at 535 nm. At temperatures of 460 C and above, efficient ashing was obtained. The effect of various volumes of ashing aid (50 percent magnesium nitrate) was also studied. Maximum recovery and precision were obtained when a minimum of 8 ml 50 percent magnesium nitrate was used. Standard recoveries of inorganic arsenic added to NBS orchard leaves and a sample of dry marine fish tissue gave values of 91-98 percent. Analyses of a number of standard NBS orchard leaves and marine fish As-1 and As-2 gave coefficients of variation of 7.0, 6.0, and 8.1 percent, respectively. Results from dry ashing and wet digestion of a number of species of marine fish were not comparable. Levels of arsenic found in different species of marine fish ranged from less than 0.4 to 27.0 micrograms As/g wet weight. Crabs were found to contain elevated amounts of arsenic. (Holoman-Battelle)
W73-10482

RAPID, SENSITIVE METHOD FOR DETERMINATION OF MERCURY IN A VARIETY OF BIOLOGICAL SAMPLES,
North Dakota State Univ. Fargo. Dept. of Animal Science.
F. D. Deitz, J. L. Sell, and D. Bristol.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 378-382, March 1973. 4 fig, 2 tab, 6 ref.

Descriptors: *Mercury, *Pollutant identification, *Chemical analysis, Milk, Soil analysis, Alfalfa, Heavy metals, Temperature.
Identifiers: *Biological samples, *Flameless atomic absorption spectrophotometry, Accuracy, Sample preparation, Meat, Precision, Detection limits, Wet digestion, Sensitivity.

A simple, rapid method is described for the routine determination of mercury at levels as low as 2 ng (2 ppb) in a wide variety of biological samples. Vanadium pentoxide-catalyzed wet digestion at 140 C was used for complete oxidation of organic tissue. Mercury was determined by flameless atomic absorption spectrophotometry, utilizing a syringe technique to transfer mercury-containing vapor to the absorption cell. Replicate analyses of samples on different days showed good precision and accuracy. Coefficients of variations for determinations within a days run ranged from 2 to 17 percent at mercury concentrations of 30 to 40 ppb. Results agreed very closely with those obtained by neutron activation analyses of the same samples. On a routine basis, 2 analysts can analyze 30-40 samples/day. (Holoman-Battelle)
W73-10483

A QUANTITATIVE PUSH-NET SYSTEM FOR TRANSECT STUDIES OF LARVAL FISH AND MACROZOOPLANKTON,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 07B.
W73-10485

CONTAMINATION OF SURFACES BY BACTERIAL NEUSTON,
California Univ., Berkeley. Naval Biomedical Research Lab.
L. H. Disalvo.
Limnology and Oceanography, Vol 18, No 1, p 165-168, January 1973. 2 tab, 10 ref. N00014-69-A-0200-1001.

Descriptors: *Air-water interfaces, *Sampling, Fouling, Marine bacteria, Sea water, Cultures, Water pollution effects, Aggregates, Organic matter, Population.
Identifiers: *Viable counts, *Neuston.

Primary bacterial fouling of glass both underwater and at the air-sea surface was investigated. A sampler called the MT or mousetrap device was constructed for the investigations. This device basically consisted of a plexiglass case fitted with doors which could be actuated by the springs and bars of a 9 by 18 cm rattrap. The sampling surfaces were marbles mounted on the stainless steel inside the case. When the sampler was lowered into the water, the doors were opened by shifting the sampler weight to a door control line. After a specified period of time, the doors were closed, the sampler retrieved and the marbles removed and treated to remove fouling organisms for counting. In two replicate experiments, bacteria were counted from: (a) marbles lowered and raised through the air-sea interface, (b) marbles lowered through the interface but protected by the MT device, (c) water samples obtained at the air-sea interface, and (d) water samples obtained beneath the surface. Interface water samples were collected with sterile stainless steel screens 25 sq cm, having 1-mm openings and a wire thickness of 0.4 mm. Interfacial water samples contained about one order of magnitude higher viable counts than subsurface waters, and marbles contacting the air-sea interfaces retained almost three order of magnitude more bacteria then protected marbles. There were daily fluctuations in bacteria retained. The measurements show that rapid irreversible sorption of over 1000 bacteria/cm occurred within 1-2 minutes of immersion in natural waters typically containing 1000-100,000 colonies/ml. It is suggested that the rapidity of this attachment could air in the linkage of particles near the sea surface and act as a mechanism for the formation of organic aggregates. (Little-Battelle)
W73-10488

THE VALIDITY OF THE APPLICATION OF SIMPLE KINETIC ANALYSIS TO HETEROGENEOUS MICROBIAL POPULATIONS,
Southampton Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-10489

ADSORPTION OF CHLORINATED HYDROCARBONS FROM SEAWATER BY A CROSSLINKED POLYMER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-10490

DEVELOPMENT OF AN OIL/WATER POLLUTION MONITOR,
Naval Postgraduate School, Monterey, Calif.
F. K. McGrath.
Available from the National Technical Information Service as AD-747 084, $3.00 in paper copy, $0.95 in microfiche. Master's Thesis, June 1972. 35 p, 11 fig, 10 ref.

Descriptors: *Oily water, *Monitoring, *Electronic equipment, *Ultrasonics, Water analysis.
Identifiers: *Fuel oil, Bilge water, Ballast water.

Because of the simplicity, ruggedness, and state of the art, ultrasonic techniques were chosen for monitoring oil in bilge and ballast water from ships. Crystalline quartz was used to produce ultrasonic waves at 30 Mhz which were monitored for attenuation using another quartz crystal. The system was tested in the laboratory with a tank designed to circulate contaminated water past the monitor. Calibrations were made with distilled water before testing with water containing up to 500 ppm fuel oil. Results with contaminated tap water were inconclusive, but attenuation was found to vary linearly with oil concentration when the contaminant level was less than 500 ppm in distilled water. Turbulence disturbed the signals, but could probably be eliminated by filtering. Although results are preliminary, the method is potentially useful for monitoring relatively low levels of oil in water. (Little-Battelle)
W73-10491

REVERSE PHASE THIN LAYER CHROMATOGRAPHY OF SOME AROCLORS, HALOWAXES, AND PESTICIDES,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
D. L. Stalling, and J. N. Huckins.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 367-372, March 1973. 6 fig, 3 tab, 7 ref.

Descriptors: *Polychlorinated biphenyls, *Pollutant identification, *Chlorinated hydrocarbon pesticides, *Pesticide residues, Chemical analysis, Separation techniques, Aldrin, Dieldrin.
Identifiers: *Thin layer chromatography (Reverse phase), *Chlorinated naphthalenes, Aroclor 1232, Aroclor 1248, Aroclor 1254, Aroclor 1260, Halowax 1099, Holowax 1013, Halowax 1014, Solvent extraction systems, GLC-Mass spectrometry, Gas liquid chromatography, p p' DDT, p p' DDE, Chlordane, Isomers, Precision, Reproducibility, Sensitivity, Carassius auratus, Goldfish, Electron capture gas chromatography.

The components of Aroclors 1232, 1248, 1254, and 1260; Halowaxes 1099, 1013, and 1014; and several chlorinated pesticides were resolved by reverse phase thin layer chromatography (RPTLC), which permits component separation by partition between a nonpolar stationary phase and a polar mobile phase. R sub f values of resulting spots were calculated for 2 of 4 new solvent systems (mobile phases). RPTLC patterns were reproducible and characteristic of each material examined. The spots were recovered from the plates and characterized by gas-liquid chromatography (GLC) and/or GLC-mass spectrometry. In some cases, single GLC peaks of Aroclor standards were resolved into more than one component by RPTLC, whereas some RPTLC spots of Halowaxes were resolved into as many as 4 GLC peaks. The analysis of environmental residues of chlorinated compounds was facilitated by this technique. (Holoman-Battelle)
W73-10492

COMPARATIVE STUDIES OF THIN LAYER CHROMATOGRAPHIC SYSTEMS FOR THE SEPARATION AND IDENTIFICATION OF PHOTOALTERATION PRODUCTS OF PARATHION,
Mississippi Agricultural and Forestry Experiment Station, State College.
R. L. Joiner, and K. P. Baetcke.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 338-340, March 1973. 3 tab, 27 ref.

Descriptors: *Separation techniques, *Pollutant identification, Methodology, Organophosphorus pesticides, Chemical analysis, Phenolic pesticides, Insecticides, Phosphothioate pesticides, Solvent extractions.
Identifiers: Parathion, *Thin layer chromatography, *Photodecomposition, *Degradation products, Sample preparation, Infrared spectra, Infrared spectroscopy, Paraoxon, Organic solvents, Solvent extraction systems, Petroleum ether, Ethyl ether, Glacial acetic acid, Methanol, Chloroform, Ammonium hydroxide, O S-diethyl O-p-nitrophenyl phosphate, O O-diethyl S-p-nitrophenyl phosphate, O-ethyl O-O-bis (p-nitrophenyl) phosphorothioate, ethyl bis (p-nitrophenyl) phosphate, O O-diethyl O-phenyl

phosphororthioate, Diethyl phenyl phosphate, p-Nitrophenol, pAminophenol, Diethyl phosphate, Ethyl phosphate.

Twelve thin layer chromatographic systems were compared for the separation of photoalteration products of parathion. R sub f values for each component in each system are presented. Infrared spectra confirmed the identity of separated components. The following 4 systems were designated superior and gave excellent separation of the components: petroleum ether-ethyl ether-glacial acetic acid (80 plus 15 plus 5 and 50 plus 45 plus 5), methanol-chloroform-ammonium hydroxide (24 plus 75 plus 3.5), and methanol-chloroform-petroleum ether (10 plus 20 plus 70). (Holoman-Battelle)
W73-10493

GAS CHROMATOGRAPHIC DETERMINATION OF ETHYLENE THIOUREA RESIDUES,
Rohm and Haas Co., Bristol, Pa. Bristol Research Labs.
L. D. Haines, and I. L. Adler.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 333-337, March 1973. 2 fig, 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Chemical analysis, *Pollutant identification, Thiocarbamate pesticides, Fungicides, Methodology, Gas chromatography, Solvent extractions, Carbamate pesticides.
Identifiers: *Flame photometric gas chromatography, *Ethylene thiourea, Sample preparation, Column chromatography, Sensitivity, Chemical recovery, Methanol, Metabolites, Organic solvents, Specificity.

Residues of ethylene thiourea on food crops were determined by extracting the sample with methanol, partially purifying the extract on an alumina column, and derivatizing the ethylene thiourea extracted with 1-bromobutane in the presence of dimethylformamide and sodium borohydride. The resulting derivative was measured by gas chromatography, using a flame photometric detector. The method is suitable for routine use and is sensitive to 0.01 ppm. (Holoman-Battelle)
W73-10494

RESIDUES OF MS-222 IN NORTHERN PIKE, MUSKELLUNGE, AND WALLEYE,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
J. L. Allen, C. W. Luhning, and P. D. Harman.
Investigations in Fish Control Report No 45, July 1972. 8 p, 3 tab, 6 ref.

Descriptors: *Walleye, *Colorimetry, Pollutant identification, Freshwater fish, Pikes, Temperature, Chemical analysis.
Identifiers: *MS-222, *Northern pike, *Muskellunge, *Muscle, *Thin layer chromatography, Drugs, Esox masquinongy, Esox lucius, Stizostedion vitreum, Anesthetics, Tricane methanesulfonate, Detection limits.

Residues of MS-222 in muscle of northern pike, muskellunge, and walleye following anesthesia at selected temperatures were measured by the modified Bratton-Marshall colorimetric method (Walker and Schoettger, 1967b) and confirmed by thin-layer chromatography (Allen, Luhning, and Harman, 1970). The mean concentration of MS-222 residues at the 0-hour withdrawal interval ranged from 2.4 to 19.5 ppm. The level of MS-222 residues at 0-hour withdrawal was highest in northern pike and lowest in walleye. After 24 hours withdrawal from the anesthetic, residues were detected in only 2 of the 12 northern analyzed by thin-layer chromatography, and these two samples were shown to contain less than 2.0 ppm. (Holoman-Battelle)
W73-10496

ANALYSIS OF SOLUBLE BERYLLIUM BY GAS CHROMATOGRAPHY,
Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio.
M. L. Taylor, and E. L. Arnold.
Available from the National Technical Information Service as AD-753 112, $3.00 in paper copy, $0.95 in microfiche. Final Report No. AMRL-TR-71-117, August 1972. 36 p, 3 fig, 13 tab, 8 ref. Project No. 6302. Contract Nos. F33615-71-C-1008, F33615-69-C-1062.

Descriptors: *Beryllium, Aqueous solutions, Calibrations, *Gas chromatography, Radioactivity techniques, Separation techniques, Chelation.
Identifiers: *Biological samples, *Tissue, *Blood, Electron capture gas chromatography, Detection limits, Sample preparation, Chromatograms, Recovery, Rats, Liver, Spleen.

A new microanalytical method for the detection and quantitation of beryllium in aqueous samples and biological specimens has been developed. The method, based upon quantitation of chelated beryllium by gas chromatography, was employed to detect beryllium in both in vitro samples and tissues of rats given beryllium by injection. Beryllium was administered in the form of aqueous solutions of beryllium sulfate, and as litte as 10 nanograms beryllium per gram of whole blood were detected and quantitated. In vivo studies which compared gas chromatographic analyses with radiometric analyses confirmed the validity of the new microanalytical technique. Preliminary studies were conducted to determine the ability of fluorinated chelating agents to remove beryllium oxide from the lungs of rats. (Little-Battelle)
W73-10497

A STUDY OF THE EFFECT OF PH ON THE DETERMINATION OF ZINC BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Geological Survey, Sacramento, Calif.
A. E. Dong.
Applied Spectroscopy, Vol 27, No 2, p 124-128, March/April 1973. 2 fig, 9 tab, 14 ref.

Descriptors: *Water analysis, *Zinc, *Hydrogen ion concentration, Potassium, Manganese, Spectrophotometry, Groundwater, Absorption, Elements (Chemical).
Identifiers: *Errors, *Atomic absorption spectrophotometry, Lithium, Chemical interference.

Errors in zinc determinations in natural water by atomic absorption spectrophotometry have been found to result from variations in pH. Consequently, a study was conducted to determine the effect of pH on the analysis of zinc. Comparative analyses were also run on lithium, potassium, and manganese. Foreign species, phosphates and silicates, were added to some of the zinc solutions to study possible chemical interferences. Results showed that lithium, potassium, and manganese absorptions were essentially unaffected by pH changes. However, results with zinc showed that zinc absorption is constant in the pH range of about 2 to 5. Between pH 5 and 10, a sharp decrease in absorption is observed. With an increase above pH 10, zinc absorption levels off to a constant value. Experimental data suggested that pH variation rather than chemical interferences is primarily responsible for the variation of absorption in zinc analysis. Several possibilities, such as sorption of zinc to container walls, zinc hydroxide formation, zinc complex formation, and zinc oxide formation in flame subsequently attacked by hydrogen atoms, have been considered in aed using a 45 percent phenol extraction procedure, was found to contain lipid A fraction to 27 percent of the LPS by weight. In the lipid A fraction, glucosamine was the only amino sugar to be present, and a high molar ratio of phosphate to amino sugar (2.5:1) was noted. Two hydroxy fatty acids, hydroxydodecanoic and hydroxymyristic, were identified among the fatty acids by gas-liquid chromatography. A role of the lipopolysaccharides in the salt requirement of marine bacteria is suggested (Little-Battelle)
W73-10499

ULTRASTRUCTURE OF STAPHYLOCOCCUS EPIDERMIDIS AFTER FREEZE-ETCHING AND THIN SECTIONING,
McGill Univ., Montreal (Quebec). Dept. of Microbiology.
J. E. Gilchrist, and I. W. DeVoe.
Canadian Journal of Microbiology, Vol 19, No 2, p 294-295, February 1973. 6 fig, 12 ref.

Descriptors: *Pollutant identification, Separation techniques, *Electron microscopy.
Identifiers: *Staphylococcus epidermidis, *Ultrastructure, Freeze etching, Thin sectioning.

Staphylococcus epidermidis was isolated from a gradient plate and freeze etched for examination of ultrastructure. Typical of Staphylococcus, the cell walls consisted of three layers: a dense outer layer, a rather electron translucent middle layer, and a very dense layer next to the cytoplasmic membrane. Numerous mesosomes of both the vesicular and laminar types were evident in thin sections. Single vesicular structures that appeared to be invaginations of the trilaminar cytoplasmic membrane were also observed. (Little-Battelle)
W73-10500

STUDIES OF THE CELL ENVELOPE OF VIBRIO PARAHAEMOLYTICUS,
Georgetown Univ., Washington, D.C. Dept. of Biology.
C. F. Deneke, and R. R. Colwell.
Canadian Journal Microbiology, Vol 19, No 2, p 241-245, February 1973. 4 fig, 1 tab, 29 ref.

Descriptors: *Separation techniques, *Marine bacteria, *Pollutant identification, Pathogenic bacteria, Gas chromatography, Foods, Cultures.
Identifiers: *Gas liquid chromatography, *Vibrio parahaemolyticus, *Fatty acids, Seafoods.

Components of the cell envelope of Vibro parahaemolyticus were investigated. Vibrio parahaemolyticus is an estuarine microorganism associated with diseases of marine and estuarine animals and seafood-borne enteritis in man. Purified lipopolysaccharide (LPS), isolated using a 45 percent phenol extraction procedure, was found to contain lipid A fraction to 27 percent of the LPS by weight. In the lipid A fraction, glucosamine was the only amino sugar to be present, and a high molar ratio of phosphate to amino sugar (2.5:1) was noted. Two hydroxy fatty acids, hydroxydodecanoic and hydroxymyristic, were identified among the fatty acids by gas-liquid chromatography. A role of the lipopolysaccharides in the salt requirement of marine bacteria is suggested. (Little-Batelle)
W73-10501

SIMPLIFIED GAS CHROMATOGRAPHIC PROCEDURE FOR IDENTIFICATION OF BACTERIAL METABOLIC PRODUCTS,
Umea Univ., (Sweden). Dept. of Oral Microbiology.
J. Carlsson.
Applied Microbiology, Vol 25, No 2, p 287-289, February 1973. 3 fig, 3 ref.

Descriptors: *Anaerobic bacteria, *Separation techniques, *Gas chromatography, Cultures, Methodology, Coliforms, Enteric bacteria, Pollutant identification.
Identifiers: *Fatty acids, Lactic acid, Pyruvic acid, Succinic acid, Sample preparation, Lactobacillus acidophilus, Bifidobacterium eriksonii, Eubacterium limosum, Chromatograms, Glucose broth.

UNIVERSITY OF ILLINOIS URBANA CHAMPAIGN

A rapid and simple procedure is described for analysis of fermentation products from anaerobic bacteria grown in glucose broth. A 1-ml sample of the culture is drained through cation-exchange resin in a Pasteur pipette. The effluent fluid is directly analyzed isothermally in a gas chromatograph for volatile fatty acids (C2 to C6) as well as for lactic, pyruvic, and succinic acids. This procedure is considered to be suitable for routine use in clinical bacteriology. (Little-Battelle)
W73-10502

STRUCTURE ACTIVITY CORRELATIONS OF BIODEGRADABILITY OF DDT ANALOGS,
Illinois Univ., Urbana. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W73-10504

THE P-VALUE APPROACH TO QUANTITATIVE LIQUID-LIQUID EXTRACTION OF PESTICIDES AND HERBICIDES FROM WATER. 2. SELECTION OF WATER: SOLVENT RATIOS AND NUMBER OF EXTRACTIONS,
Drexel Univ., Philadelphia, Pa. Environmental Studies Inst.
L. H. Suffet.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 288-294, March/April 1973. 1 fig, 6 tab, 26 ref. EPA Project 16020FYT. Grant No 801179.

Descriptors: Water, *Solvent extractions, *2 4-D, Separation techniques, Herbicides, Computer programs, Solvents.
Identifiers: *Water-solvent ratios, *Chemical recovery, Sample preparation, Liquid-liquid extraction, Benzene, Hexane, Ethyl ether, Ethyl acetate, Chloroform.

Equations are developed from liquid-liquid extraction theory for the number of extractions and water: solvent ratios for maximum recovery for typical p-values (P-value is defined as the fraction of the total solute that distributes itself in the nonpolar phase of an equivolume solvent pair). A computer program analysis of the equations developed indicates that a pesticide which has a p-value greater than or equal to 0.90 in an aqueous solvent system can be extracted from the aqueous phase with 95 percent recovery in no more than 5 successive extractions of at least 50 ml with a total volume of more than 500 ml of solvent. The equations were successfully tested with serial extraction of 2, 4-D by separatory funnel and vortex stirring extraction procedures. The contribution to the total error of initial LLE step was estimated to be less than 20 percent for a four-step serial extraction. (Little-Battelle)
W73-10505

HYDROLYSIS OF AQUEOUS SOLUTIONS OF SODIUM 2,2-DICHLOROPROPIONATE UNDER SELF-INDUCED ALKALINE CONDITIONS,
Agricultural Research Service, Fargo, N. Dak. Metabolism Lab.
For primary bibliographic entry see Field 05B.
W73-10506

TRACE ELEMENT ANALYSIS BY PROTON-INDUCED X-RAY EXCITATION,
Maryland Univ., College Park.
F. C. Young, M. L. Roush, and P. G. Berman.
International Journal of Applied Radiation and Isotopes, Vol 24, No 3, p 153-163, March 1973. 8 fig, 11 ref.

Descriptors: *X-ray fluorescence, *Trance elements, *Pollutant identification, X-ray analysis, Chemical analysis, Sediments, Plankton, Enzymes, Air pollution, Perches, Efficiencies, X-rays, Algae.
Identifiers: *Environmental samples, *Biological samples, *Multielemental analysis, Chemical composition, Sensitivity, Detection limits, Blood, Liver, Hemoglobin, Lithium-drifted silicon detector, Brain, Swordfish, Hair, Sample preparation.

The potential for the simultaneous analysis of samples for traces of all elements with an atomic number (Z) greater than or equal to 15 by x-ray fluorescence using 2.5-MeV protons is described along with the advantages and limitations of the technique. Only miligram quantities of material are required and the sensitivity changes quite slowly and smoothly from element to element in contrast to the method of neutron activation. The technique is nondestructive and a minimum or no work in sample preparation is required. The sample must be thin and reasonably uniform. For maximum sensitivity, the sample must be either self-supporting or mounted on a very thin backing. Samples are generally placed in a high vacuum for irradiation although the potential exists to irradiate samples outside the vacuum by passing the beam through a thin window. This technique has been applied to a variety of environmental and biological materials, including air pollution, sediment, plankto, perch blood and liver enzyme, and hemoglobin. For samples of 0.1 mg/sq cm in thickness, sensitivities as small as 0.1 ppm can be expected. (Holoman-Battelle)
W73-10508

TWO INSTRUMENTS FOR ACTIVATION ANALYSIS OF SOLUTIONS BY A DILUTION METHOD,
Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
For primary bibliographic entry see Field 07B.
W73-10509

A RAPID, INEXPENSIVE COULOMETRIC DETERMINATION OF SULPHUR IN PETROLEUM PRODUCTS,
Laporte Industries Ltd., Widnes (England).
J. M. Carter.
Analyst, Vol 97, No 1161, p 929-936, December 1972. 5 fig, 3 tab, 5 ref.

Descriptors: *Sulfur, *Oil, Laboratory equipment.
Identifiers: Recovery, *Detection limits, *Sample preparation, Precision, *Coulometric titration, Sensitivity, Oil characterization.

A method has been developed for determining sulfur in oil using a combustion chamber and measuring with a coulometric cell the quantity of sulfur dioxide produced. The coulometer used was a Thorn T.E. 110, and the combusion chamber was a modified Gallenkamp C and H microfurnace. With the setup described, it was possible to determine sulfur in oils in the range of 0.01 to 1.0 percent m/m. The advantages of the method are: Samples can be analyzed in triplicate in 5 minutes; a low degree of operator skill is required to operate the equipment; the method has good precision (coefficient of variation of the mean is 1.4 percent); the method should be usable for determining nitrogen in oil; small samples (0.5 microliter) are used; and the cost of the set up is low (600 pounds). (Little-Battelle)
W73-10510

MODIFICATION OF AN ISCO DRUM FRACTION COLLECTOR TO PERMIT USE OF STOPPERED TEST TUBES,
Rockefeller Univ., New York.
M. P. Printz, R. K. Franz, and N. A. Jernberg.
Analytical Biochemistry, Vol 51, No 2, p 482-485, February 1973. 2 fig, 2 ref.

Descriptors: *Chromatography, Laboratory equipment, Design.
Identifiers: *Fraction collector.

An Isco Fraction Collector has been modified to permit use of stoppered test tubes for collection of column effluents. This unit was developed for and serves a critical function as part of the system used for automated tritium-hydrogen exchange measurements. The primary need for a stoppered test tube fraction collector was (1) to reduce evaporation from 300-microliter column fractions obtained during overnight experiments, and (2) to prevent radioactive cross contamination. However, such a stoppered system should also be valuable for other applications, such as for minimizing evaporation of volatile organic solvents used in either lipid or partition chromatography. (Little-Battelle)
W73-10513

A NEW, SENSITIVE METHOD FOR THE DETERMINATION OF STREPTOMYCIN,
Magyar Tudomanyos Akademia, Szeged. Inst. of Biochemistry.
E. Duda.
Analytical Biochemistry, Vol 51, No 2, p 651-653, February 1973. 2 fig, 6 ref.

Descriptors: *Antibiotics (Pesticides), *Methodology, *Assay, *Spectrophotometry, *Pollutant identification, *Aqueous solutions, Chemical analysis, Chemical reactions, Biochemistry.
Identifiers: *Streptomycin, Thiobarbituric acid, Absorbance, Reproducibility, Sensitivity, Absorption spectra, N-acetyl glucosamine, Streptidine, 2-deoxy-D-glucose.

In order to avoid the difficulties involved in most chemical methods for the determination of streptomycin, a new assay method based on the periodate-thiobarbituric acid method has been developed. This method uses the observation that the reaction product of streptomycin gives a sharp absorption maximum at 415. This maximum is absent from spectra of other compounds tested - including deoxy sugars, streptidine, N-acetyl-glucosamine. A quantity of the streptomycin solution was mixed with potassium metaperiodate in 1 N H_2SO_4. The mixture was incubated for 15 min at 37 degrees; 2 percent $NaAsO_2$ in 0.5 N HCl was added with shaking; and a 0.3 percent thiobarbituric acid reagent was added after the brownish color disappeared. This mixture was placed in a waterbath for 10 min and the absorbance was measured at 45 nm. The method described gives reproducible results; its sensitivity is equal or better than the sensitivity of other chemical streptomycin assays (the color is stable at least for an hour), and its higher specificity allows its use in cases in which the former methods are not applicable. (Holoman-Battelle)
W73-10514

THE ATOMIC ABSORPTION DETERMINATION OF ZINC WITH A GRAPHITE FURNACE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
D. Clark, R. M. Dagnall, and T. S. West.
Analytica Chimica Acta, Vol 63, No 1, p 11-18, January 1973. 4 fig, 3 tab, 5 ref.

Descriptors: *Zinc, *Aqueous solutions, *Pollutant identification, Heavy metals, Chemical analysis, Anions, Cations, Alkali metals, Solvent extractions, Temperature, Silicates, Sulfates, Chlorides, Nitrates, Sodium, Phosphates, Potassium, Copper, Nickel, Aluminum, Cobalt.
Identifiers: *Ionic interference, *Atomic absorption spectrophotometry, *Solvent extraction systems, *Heated graphite furnace, Detection limits, Chemical concentration, Chemical interference, Organic solvents, Acetates, Barium, Tin, Antimony.

The use of a heated graphite furnace has been evaluated for the atomic absorption determination of zinc. Interference and the use of solvent extraction to overcome such have been investigated. Five-microliter aliquots were applied to different

points along the furnace. The peak height obtained by heating at lower temperatures varied with the sample position, heating at a higher temperature yielded rather constant peak heights. All the ions tested caused interference when present in large amounts. Many of the interferences can be successfully avoided by using most of the solvent extraction systems. Results of the study of solvent extraction for the elimination of interference show that organic solvents cause no problems with the graphite furnace; no surface tension, viscosity, density or enhanced 'nebulizer' effects were noted. The detection limit obtained with aqueous solutions can be lowered by preconcentration in the solvent extraction step, the limiting factor being reagent in solvent blanks. Determinations of zinc were made in the 0.002-1 ppm range. (Holoman-Battelle)
W73-10515

USE OF A BOD OXYGEN PROBE FOR ESTIMATING PRIMARY PRODUCTIVITY,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.

Limnology and Oceanography, Vol 18, No 1, p 152-154, January 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Primary productivity, *On-site data collections, *Dissolved oxygen, *Measurement, *On-site tests, Water sampling, Biochemical oxygen demand, On-site investigations, Methodology, Instrumentation.
Identifiers: *BOD oxygen probe, *Photosynthetic rates, Dissolved organic carbon, Analysis of variance, Data interpretation, Van Dorn sampler, Experimental error, Sample preparation, Accuracy, Winkler method.

The accuracy of a BOD oxygen probe for field measurements of primary production by the light and dark bottle oxygen technique has been analyzed. Water samples were taken from various depths with a Van Dorn sampler and subsamples placed in light and dark BOD bottles. DO was measured in each bottle before and after a 6-hr in situ incubation. A single water sample was used to measure DOC and to calibrate the oxygen probe. Preparation time at the beginning of each experiment was 1.4 min per bottle, and the time required to measure DOC at the end of each incubation was 0.6 min per bottle. The light bottle change in DOC for seven photosynthesis vs. depth experiments ranged from minus 0.40 to plus 0.90 ppm and the dark bottle change plus 0.05 to minus 0.70 ppm. The ambient DOC was 7-10 ppm. Variability was reduced by pairing the 2 readings from each bottle; a one-way ANOVA was used to estimate experimental error. A figure is presented with which to estimate the number of replicate bottles needed to obtain a given accuracy in estimating photosynthetic rates. The BOD oxygen probe was shown to be a rapid, convenient instrument when used to estimate primary production, and its accuracy in certain cases may be comparable to that of the Winkler method. (Holoman-Battelle)
W73-10517

ON THE STORAGE OF SEAWATER SAMPLES FOR AMMONIA DETERMINATION,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
D Degobbis.
Limnology and Oceanography, Vol 18, No 1, p 146-150, January 1973. 5 fig, 13 ref.

Descriptors: Storage, *Ammonia, Filtration, *Freezing, *Seawater, Water analysis, Chemical analysis, *California.
Identifiers: *Sample preservation, Sample containers, Sample preparation, Glass bottles, Polyethylene bottles, *Monterey Bay (Calif).

In order to clarify conflicting results concerning the effect of storage on ammonia concentration, a study was initiated to investigate the effects of various storage parameters. Seawater samples were collected from Monterey Bay, California. Portions of the samples were analyzed immediately in shipboard laboratories. The remaining portions were stored in glass or polyethylene containers; filtered or unfiltered; slow frozen or quick frozen and with or without added preservatives. After various periods of time up to 20 days, samples were thawed, analyzed by the phenol-hypochlorite method, and the results compared with those from the unstored samples. The results showed significant changes in samples stored without treatment. Ammonia increased when stored in glass, but decreased when stored in polyethylene containers. Quick freezing and slow freezing stabilized ammonia concentrations, although variability was increased; quick freezing had no advantage over slow freezing. Preservation with phenol at the same concentration used in the analytical method (0.4 g 100 per ml) stabilized unfrozen samples for up to 2 weeks. (Little-Battelle)
W73-10518

A FIELD FIXATION TECHNIQUE FOR DISSOLVED PHOSPHATE IN LAKE WATER,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W73-10519

CHARACTERISTICS OF THE NEARSHORE ENVIRONMENT OFF THE SOUTH COAST OF ANVERS ISLAND, ANTARCTIC PENINSULA,
California State Univ., Hayward. Dept. of Earth Sciences.
D. A. Warnke, J. Richter, and C. H. Oppenheimer.
Limnology and Oceanography, Vol 18, No 1, p 131-142, January 1973. 4 fig, 5 tab, 40 ref.

Descriptors: *Sediments, Distribution patterns, *Nutrients, *Sea water, *Connate water, *Bacteria, Water quality, Sedimentation, Organic matter, Oxidation-reduction potential, Hydrogen ion concentration, Silica, Water analysis, *Antarctic, Nitrites, Nitrates, Cycling nutrients, Sampling, Cultures, Carbon, Silicates, Phosphates, Volumetric analysis, Population, Primary productivity, Chemical analysis.
Identifiers: *Culture media, Agars, Texture.

A study was carried out in Arthur Harbor and vicinity, Antarctic Peninsula, in February and March 1967, to establish the characteristics of bottom sediments and the overlying water column, to determine the bacterial numbers in water and sediment samples, to relate these quantitiies to several environmental parameters, and to determine which, if any, of them act as determinants of bacterial distribution. In addition, the possibility of bacterial liberation of nutrients from the surrounding rock outcrops, and their addition to the nearshore nutrient budget, were investigated. The sediments are diamictons and display great lateral variability. Their organic carbon content falls within the range of values for oceanic sediments. Silica concentrations in the interstitial water of these sediments seems to be controlled by biogenic processes of sedimentation. Bacteria are preferentially associated with sediments rich in clay-sized materials and show little or no correlation with organic carbon in these samples; the surface properties of the fine sediment may be important. Bacterial numbers in the water column are similar to those reported for open-ocean areas below 200 m in lower latitudes. Nutrient values are high, but many nitrite values are low relative to nitrate as in lower latitudes before the growth season and in the open ocean below the euphotic zone. These similarities may indicate that primary productivity at the time and place of investigation was low. (Little-Battelle)
W73-10520

THE EXTRACTION OF THE CHROMIUM (III)--EDTA COMPLEX BY SOLUTIONS OF ALIQUAT-336 IN VARIOUS ORGANIC SOLVENTS,
Leeds Univ. (England). Dept. of Inorganic and Structural Chemistry.
H. M. N. H. Irving, and R. H. Al-Jarrah.
Analytica Chimica Acta, Vol 63, No 1, p 79-84, January 1973. 2 fig, 2 tab, 14 ref.

Descriptors: *Chromium, *Aqueous solutions, Separation techniques, Anion exchange, Trace elements, Methodology, Solvent extractions, Chemical analysis, Chelation, Heavy metals.
Identifiers: *Organic solvents, *EDTA, *Metal chelates, *Ion exchange resins, Aliquat-336-Cl, Sample preparation, Amyl alcohol, Chloroform, 1 2-Dichloroethane, Hexone, Carbon tetrachloride, Methyl isobutyl ketone, Benzene, Nitrobenzene, p-Xylene, Hexane.

The percentage of chromium (III) extracted as the complex anion CrY (H2O) from solutions containing a 10 percent excess of EDTA (H4Y) by the liquid anion-exchanger Aliquat-336-Cl is shown to increase with change of organic solvent ('diluent') in the order amyl alcohol less than chloroform less than 1,2-dichloroethane less than hexone less than carbon tetrachloride less than benzene less than nitrobenzene less than p-xylene less than hexane. With mixtures of p-xylene and chloroform there is a minimum at 0.4 mole fraction of xylene. The order of solvents can best be correlated with their solubility parameters. With hexane the organic phase separates into two layers of which the one of larger volume (80 percent of total) contains very little extracted ion-pairs. The enhanced concentration of chromium (III) in the organic phase of smaller volume can be exploited analytically. (Holoman-Battelle)
W73-10523

STUDIES IN THE COMPLEX FORMATION OF METAL IONS WITH SUGARS. PART I. THE COMPLEX FORMATION OF COBALT (II), COBALT (III), COPPER (II) AND NICKEL (II) WITH MANNITOL,
Oslo Univ. (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-10524

THE DIRECT DETERMINATION OF CHROMIUM IN URINE BY SELECTIVE VOLATILIZATION WITH ATOM RESERVOIR ATOMIC ABSORPTION,
Environmental Protection Agency, Perrine, Fla. Perrine Primate Lab.
R. T. Ross, J. G. Gonzalez, and D. A. Segar.
Analytica Chimica Acta, Vol 63, No 1, p 205-209, January 1973. 1 fig, 1 tab, 24 ref.

Descriptors: *Trace elements, *Chromium, *Methodology, Chemical analysis, Heavy metals, Pollutant identification.
Identifiers: *Heated graphite atomizer, *Urine, *Atom reservoir atomic absorption spectrophotometry, Sample preparation, Accuracy, Precision, Biological samples, Detection limits, Chemical digestion, Atomic absorption spectrophotometry.

Samples of urine were analyzed by the atom reservoir atomic absorption technique for the presence of chromium before and after digestion. The samples were digested by adding 1 ml of nitric acid to 1 ml of urine in teflon vials. The vials were tightly closed to prevent leaks and were placed in an 80 degree oven for 1 and 24 h. After heating, the samples were cooled to room temperature, and then 20 microliters were removed by means of an Eppendorf pipette and injected into the heated graphite atomizer. The relative standard deviation for peak signals calculated from twenty injections of 20-microliter aliquots of urine containing 20 ppb of chromium was 2 percent. For aqueous solutions of

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the same concentrations the relative standard deviation was 10 percent. These data are in close agreement with the reproducibilities cited in the literature. The detection limit obtained for chromium was 2.5 ppb for 20-microliter urine samples. Injections of up to 100 microliters are possible with this technique, and such injections could increase the sensitivity of the method. The ease of application and shortness of analysis time of this technique promise further applicability toward trace metal analyses in other biological materials. (Holoman-Battelle)
W73-10525

DIRECT MEASUREMENT OF LESS THAN 1 PART-PER-BILLION FLUORIDE IN RAIN, FOG, AND AEROSOLS WITH AN ION-SELECTIVE ELECTRODE,
Naval Research Lab., Washington, D.C.
T. B. Warner, and D. J. Bressan.
Analytica Chimica Acta, Vol 63, No 1, p 165-173, January 1973. 1 fig, 3 tab, 21 ref.

Descriptors: *Fluorides, *Rain, *Fog, *Aerosols, *Snow, Pollutant identification.
Identifiers: *Ion selective electrodes, Detection limits, Sample preparation, Response time, Accuracy.

Soluble fluoride in rain, snow, fog or aerosols can be determined directly in samples containing down to 0.28 ppb by an inexperienced analyst after brief training with a lanthanum fluoride electrode. The method involves little sample handling, 10-ml samples suffice, a determination takes 15-22 min and the technique can be extended over 8 decades of concentrations. Probable uncertainty ranges from 10-20 percent near 0.28 ppb to 3-6 percent above 100 ppb. The general technique compares the rate of change of potential in the unknown with that in nearby standards, and should be useful for trace determinations with other ion-selective electrodes as well. One possible application is the direct determination of other halides in rain. There does not seem to be any intrinsic reason why more dilute samples could not be handled if suitable standards could be prepared. (Little-Battelle)
W73-10526

THE INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF THE SULPHATE ION WITH 2-AMINOPERIMIDINE,
Birmingham Univ. (England). Dept. of Chemistry.
P. A. Jones, and W. I. Stephen.
Analytica Chimica Acta, Vol 64, No 1, p 85-92, March 1973. 2 fig, 2 tab, 11 ref.

Descriptors: *Spectrophotometry, *Sulfates, Methodology, *Surface waters, *Rain, *Aqueous solutions, Anions, Cations, Chemical reactions, Calibrations, Phosphates, Fluorides, Nitrates, Chemical precipitation, Chemical analysis, Pollutant identification.
Identifiers: 2-Aminoperimidine, Sensitivity, Chemical interference, Accuracy, Absorbance.

A new spectrophotometric determination of the sulphate ion is described which uses 2-aminoperimidine hydrochloride as a precipitating reagent. The excess of the reagent is measured at 305 nm. The procedure deals with sulphate in the range 4-120 ppm, and relies on simple calibration. The relative standard deviation for 50 ppm of sulphate is 3.7 percent. The interference of 100 ppm of phosphate, fluoride and nitrate is only slight in the determination of 50 ppm of sulphate. The method is recommended for the determination of sulphate in rain and surface waters. (Holoman-Battelle)
W73-10527

THE DETERMINATION OF MANGANESE IN URINE BY ATOMIC ABSORPTION SPECTROMETRY,
Maryland Univ., College Park. Dept. of Chemistry.
D. G. Van Ormer, and W. C. Purdy.
Analytica Chimica Acta, Vol 64, No 1, p 93-105, March 1973. 3 fig, 5 tab, 32 ref.

Descriptors: *Manganese, *Chemical analysis, *Methodology, Solvent extractions, Stability, Hydrogen ion concentration, Efficiencies, Copper, Molybdenum, Iron, Mercury, Lead, Cadmium, Chelation, Heavy metals, Cations, Pollutant identification.
Identifiers: *Atomic absorption spectrophotometry, *Urine, Metal chelates, Biological samples, Sample preparation, Preconcentration, Chemical interference, Ionic interference, Bismuth, Antimony chloride, Thallium chloride, Tin chloride, Methyl isobutyl ketone, Organic solvents.

An atomic absorption procedure was developed for the determination of urine manganese. Urine samples were digested with a mixture of nitric, sulfuric, and perchloric acids containing molybdate as catalyst. This wet digestion was followed by cupferron extraction into methyl isobutyl ketone to yield stable extracts of urine Mn at concentration levels quantifiable by atomic absorption spectrometry. A two-point standard addition technique was used and involved extracts of buffered, digested aliquots containing 10 and 20 ppb Mn (II) in the aqueous phase. Of the substances tested for extraction interference, only bismuth, antimony, and thallium were found to interfere. (Holoman-Battelle)
W73-10528

THE FLUORIMETRIC DETERMINATION OF PHOSPHATE WITH THIAMINE,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
J. Holzbecher, and D. E. Ryan.
Analytica Chimica Acta, Vol 64, No 1, p 147-150, March 1973. 1 fig, 4 ref.

Descriptors: *Fluorometry, *Phosphates, *Pollutant identification, *Chemical analysis, Aqueous solutions, Methodology, Chemical reactions, Anions, Cations, Heavy metals, Alkaline earth metals, Molybdenum, Nitrates, Chlorides, Bromides, Fluorides, Iodides, Silicates, Sulfides, Nickel, Manganese, Cadmium, Copper, Cobalt, Calcium, Zinc, Aluminum, Iron, Mercury, Hydrogen ion concentration.
Identifiers: *Trace levels, *Thiamine, Chemical indicators, Detection limits, Accuracy, Ionic interference, Acetates, Perchlorates, Thiocyanates, Tartrates, Citrates, EDTA, Persulfates, Hexacyanoferrates, Chemical concentration, Chemical interference.

Phosphate may be determined down to the one ppb level by a fluorimetric method which involves converting the phosphate to hexadimolybdatophosphate by adding ammonium molybdate to an acidified phosphate solution. The hexadimolybdatophosphate is then reacted with nonfluorescent thiamine to produce the highly fluorescent thiochrome, the fluorescence intensity of which is measured at 375 nm. The standard deviation of seven determinations of 50 ppb of phosphate was 3 percent; for 5 ppb the deviation was less than 10 percent. Fifty ppb of phosphate was successfully determined in the presence of a 10,000-fold molar amount of acetate, chloride, nitrate, perchlorate or thiocyanate, or a 1,000-fold amount of bromide, fluoride, or tartrate. Results were also satisfactory with a 100-fold amount of citrate, EDTA, iodide or persulphate. A 10-fold amount of silicate or hexacyanoferrate (III) could be presented but larger amounts increased the fluorescence intensity; an equivalent amount of sulphide strongly quenched the fluorescence. A 10,000-fold molar amount of Ni (II), Mn (II), or Cd (II), and a 1,000-fold amount of Cu (II), Co (II), Ca (II), Zn (II), Al (III) did not interfere. A 10-fold amount of iron (III) and an equivalent amount of iron (II) could be present, but an order of magnitude increase in concentration decreased the fluorescence. Mercury (II) and mercury (I) markedly increased the fluorescence even at equimolar ratios. Important factors in the determination of phosphate with thiamine are the starting acidity, the thiamine concentration, the molybdenum concentration and the final pH. (Holoman-Battelle)
W73-10529

THE DETERMINATION OF TOTAL NITROGEN IN PLANT MATERIALS WITH AN AUTOMATIC NITROGEN ANALYSER,
International Atomic Energy Agency, Seibersdorf (Austria).
R. Fiedler, G. Proksch, and A. Koepf.
Analytica Chimica Acta, Vol 63, No 2, p 435-443, February 1973. 3 fig, 3 tab, 3 ref.

Descriptors: *Nitrogen, *Chemical analysis, *Plant tissues, *Laboratory equipment, Methodology, *Nitrogen compounds, Grasses, Wheat, Barley, Research equipment, Rice, Organic compounds, Inorganic compounds, Regression analysis, Automatic control, Agronomic crops, Cereal crops, Pollutant identification.
Identifiers: *Automatic nitrogen analyzer, Kjeldahl procedure, Reproducibility, Accuracy, Biological materials, Ammonium sulfate, Ammonium nitrate, Glutamic acid, Acetanilide, Ammonium pyrrollidine dithiocarbamate, Potassium nitrate.

A description is given of an automatic analyzer which has been used for the measurement of total nitrogen in chemical compounds and botanical material after the combustion method of Dumas in vacuum. Several chemical compounds and plant materials were analyzed using the nitrogen analyzer. The analysis of chemicals by means of the nitrogen analyzer yielded excellent results which entirely agree with the theoretical nitrogen content of the samples. The standard deviation of a single determination was of the order of 1 percent or less, of the nitrogen content of the sample. In the analysis of plant materials, the values obtained with the N analyzer tended to be slightly higher than those obtained by the Kjeldahl procedure. The standard deviation of the single nitrogen analyzer values was of the order of 1-4 percent of the mean nitrogen content of the samples, and relatively higher for wheat, barely and rice grain. Statistical evaluation of all analytical results showed that the comparative reproducibility and accuracy of the automatic analyzer and the Kjeldahl method were very good. (Holoman-Battelle)
W73-10530

ATOMIC FLUORESCENCE CHARACTERISTICS OF COPPER IN VARIOUS PREMIXED FLAMES,
Technical Univ. of Prague (Czechoslovakia). Lab. of Flame Spectrometry.
D. Kolihova, and V. Sychra.
Analytica Chimica Acta, Vol 63, No 2, p 479-482, February 1973. 2 fig, 3 tab, 20 ref.

Descriptors: *Copper, *Physical properties, *Chemical analysis, *Aqueous solutions, Cations, Anions, Heavy metals, Pollutant identification.
Identifiers: *Atomic fluorescence spectroscopy, Characterization, Atomic fluorescence spectra, Detection limits, Ionic interference, Chemical interference, Sensitivity.

The atomic fluorescence of copper revealed that its spectrum consists of 9 resonance lines instead of the previously reported two. Analytical curves of the resonance fluorescence lines measured in

the premixed oxygen-argon-hydrogen flame are linear over 4 decades of concentration: from the limit of detection up to a concentration of about 15 micrograms/ml. Detection limits for all the copper lines in the 3 flames studied are tabulated. Interferences from solute volatilization and spectral interferences were found to be insignificant for 1000-fold (by weight) amounts of 28 common cations and anions in the premixed air-hydrogen and shielded air-acetylene flames. The absence of interferences and the high sensitivity of the atomic fluorescence method allowed a rapid direct determination of copper in blood serum to be made after 25-fold dilution of serum with twice-distilled water. (Holoman-Battelle)
W73-10531

PROCESSES AFFECTING THE OCEANIC DISTRIBUTION OF CARBON DIOXIDE,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05B.
W73-10534

A STUDY OF THE INFLUENCE OF CALCIUM ON THE EFFECTS OF DDT ON FISHES,
Mississippi Univ., University.
For primary bibliographic entry see Field 05C.
W73-10537

LARGER DIAMETER COLUMNS FOR MODERN, HIGH SPEED LIQUID CHROMATOGRAPHY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 02K.
W73-10539

STUDIES IN CHEMICAL IONIZATION MASS SPECTROMETRY,
Virginia Univ., Charlottesville,
J. F. Ryan.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor Mich., 48106, Order No. 72-33,382. Ph D Dissertation, 1972. 129 p.

Descriptors: *Organic compounds, *Chemical reactions, *Methodology, *Pollutant identification, Mass spectrometry, Alcohols, Organic acids, Ionization, Chemical analysis, Ethers.
Identifiers: *Chemical ionization mass spectrometry, CI mass spectra, Aldehydes, Ketones, Esters, Reagents, Mass spectra, CI spectra, Chemical structure, Functional groups.

Chemical ionization mass spectrometry (CIMS) was used to distinguish between acids, aldehydes, esters, ethers, and ketones, as well as between primary, secondary, and tertiary alcohols. Two methods were used to identify functional groups present in a sample molecule. The first was based on a determination of the sample's proton affinity relative to that of the source gas. The second method was based on the unique set of ions produced by each functional group in CI spectra using nitric oxide as a source gas. Argon-water source-gas mixtures were used to produce high and low resolution mass spectra which exhibit ions characteristic of both electron impact and chemical inoization methods of ionization. Mass spectra of different functional groups were obtained using trimethylsilyl cation as an ionization reagent. Peaks due to electrophilic attachment were observed in all cases. Finally negative ion chemical ionization mass spectra were recorded using oxygen as a reagent gas. (Holoman-Battelle)
W73-10541

FRESHWATER ALGAE FROM THE ITASCA STATE PARK MINNESOTA, IV. CYANOPHTA, RHODOPHYTA, CHLOROMONADOPHYCEAE, AND CRYPTOPHYCEAE,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
R. L. Meyer, and A. J. Brook.
Nova Hedwigia, Vol 22, Nos. 1-2, p 649-658, 1971. 4 ref.

Descriptors: *Aquatic algae, *Cyanophyta, *Rhodophyta, *Aquatic habitats, *Systematics, Speciation, Lakes, Ponds, Ecological distribution, Springs, Trophic level, *Minnesota, Biological communities, Phytoplankton, Eutrophication, Oligotrophy, Dystrophy, Mesotrophy.
Identifiers: *Cryptophyta, *Chloromonads, *Itasca State Park (Minn), Neuston, Epiphytes, Metaphyton, Aphanocapsa endophytica, Aphanothece clathrata, Aphanothece nidulans, Aphanothece stagnina, Chroococcus limneticus, Chroococcus turgidus, Coelosphaerium kuetzingianum, Coelosphaerium natans, Dactylococcopsis fascicularis, Dactylococcopsis raphidioides, Diplocystis aeruginosa fn. aeruginosa, Diplocystis aeruginosa fn. flos-aquae.

Recorded are the Cyanophyta, Rhodophyta, Chloromonadophyceae and Cryptophyceae of the region of Itasca State Park in northwestern Minnesota. The 32 genera and 107 species of Cyanophyta, one species of Rhodophyta, 2 species of Chloromonadophyceae and 4 genera with 12 species of cryptophyceae and annotated with description of habitat and principal subcommunity. (Holoman-Battelle)
W73-10544

DESMIDS FROM SOUTHEAST UNITED STATES OF AMERICA, (DESMIDIEEN AUS DEM SUDOSTEN DER VEREINIGTEN STAATEN VON AMERIKA),
K. Forster.
Nova Hedwigia, Vol 23, Nos. 2-3, p 515-644, 1972. 397 fig, 153 ref.

Descriptors: *Aquatic algae, *Speciation, *Systematics, Aquatic habitats, Chlorophyta, *Southeast U.S.
Identifiers: *Desmids, Gonatozygon brebissonii, Gonatozygon monotaenium, Netrium species, Penium species, Closterium species.

Algae collected by the author from the southern portion of the United States were compared with a collection of the late A. M. Scott from Florida, Mississippi and Louisiana. The desmid flora found expands the floral listing for the area. Of the 260 taxa found, 20 are new descriptions with 19 forms and varieties in the genera: Cosmarium (13), Euastrum (2), Groenbladia (1), Micrasterias (1), Pleurotaenium (1), Staurastrum (1) and Staurodesmus (1). (Holoman-Battelle)
W73-10546

METHOD FOR HIGH-SPEED LIQUID CHROMATOGRAPHIC ANALYSIS OF BENOMYL AND/OR METABOLITE RESIDUES IN COW MILK, URINE, FECES, AND TISSUES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept.
J. J. Kirkland.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 171-177, March/April 1973. 4 fig, 7 tab, 17 ref.

Descriptors: *Pesticide residues, *Fumigants, *Carbamate pesticides, Milk, Cattle, Pollutant identification, Chemical analysis, Chlorinated hydrocarbon pesticides, Urea pesticides, Organophosphorus pesticides, Phenolic pesticides, Solvent extractions, Separation techniques, Monuron, DDT, Herbicides, Insecticides, Dalapon, Heptachlor, Phosphothioate pesticides, Phenols, Chemical degradation.
Identifiers: *Benomyl, *Biological samples, *High-speed liquid chromatography, *Metabolites, Tissues, Urine, Feces, Chemical recovery, Chemical interference, Sample preparation, Cation exchange liquid chromatography, Detection limits, Benzimidazolecarbamate, Liver, Methomyl, Thiabendazole, Dicamba, Lasso, 2 6-Diethylaniline, Ethion, Strobane, Malathion, Simazine, Tetradifon, Methoxychlor, Chloroneb, Ronnel, Guthion, N-Isopropylaniline, Diphenyl amine, Atrazine, Sevin, Diuron, Linuron, Methyl parathion, Ramrod, Absorbancé, Kidneys, Fat tissue, Muscle, Ultraviolet photometric detector.

Residues of benomyl (methyl 1- (butylcarbamoyl)-2-benzimidazolecarbamate) and/or methyl 2-benzimidazolecarbamate, methyl 5-hydroxy-2-benzimidazolecarbamate, and methyl 4-hydroxy-2-benzimidazolecarbamate may be simultaneously determined in cow milk, tissues, urine, and feces. The first step in the method consists of hydrolyzing the sample in aqueous acid to convert benomyl to methyl 2-benzimidazolecarbamate and to free the metabolites from conjugates. The freed materials are then extracted into an organic solvent, the extract is cleaned up by a solvent-solvent, partitioning process, and the components are determined in a single scan by high-speed strong cation exchange liquid chromatography. Recoveries of the various components average about 80 percent in cow milk and urine, with average recoveries of about 50-80 percent obtained from tissue samples and feces. Recoveries for the various compounds have been demonstrated at the 0.01-0.02-ppm level in cow milk, at the 0.05-0.1-ppm level in tissues and feces, and at the 0.2-ppm level in urine. No interference with the method was found from a number of other pesticides with tolerances in milk and meat tissues. (Holoman-Battelle)
W73-10547

GAS CHROMATOGRAPHY OF ORGANONITROGEN PESTICIDES, USING A NITROGEN-SPECIFIC DETECTION SYSTEM,
Food and Drug Administration, Buffalo, N.Y.
R. R. Laski, and R. R. Watts.
Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 328-332, March 1973. 1 tab, 14 ref.

Descriptors: *Pollutant identification, *Chemical analysis, *Methodology, Urea pesticides, Carbamate pesticides, Chlorinated hydrocarbon pesticides, Tirazine pesticides, Organophosphorus pesticides, Phenolic pesticides, Herbicides, Insecticides, Aliphatic pesticides, Acaricides, Fungicides, Monuron, Thiocarbamate pesticides, Phosphothioate pesticides.
Identifiers: *Gas liquid chromatography, Organonitrogen pesticides, Retention time, Isomers, Electrolytic conductivity detector, Aldicarb, Aldicarb sulfoxide, Aldicarb sulfone, Fenuron, Fluometruon, CDAA, Neburon, Diuron, EPTC, Dichlobenil, Propham, Terrazole, Butylate, Vernolate, Pebulate, Isolan, Molinate, Tranid, Propoxur, Propachlor, Cycloate, Chlorpropham, Landrin I, Chlorphenamidine, Dimethoate oxygen analog, Phenmedipham, Trifluralin, Dazomet, Benefin, Bidrin, Diallate, CDEC, Azodrin.

A gas-liquid chromatographic system with a nitrogen-specific detector (electrolytic conductivity detector) was investigated for the determination of 95 organonitrogen pesticides. Each compound was chromatographed, using DC-200 liquid phase on a solid support of 80-100 mesh Chromosorb W (HP). Retention times and response data are given for these pesticides. (Holoman-Battelle)
W73-10548

SIMULTANEOUS QUANTITATION OF SALMONELLA SPECIES AND PSEUDOMONAS AERUGINOSA. I. POLLUTED WATERS. II. PERSISTENCE OF PATHOGENS IN SLUDGE TREATED SOILS. III. ANALYSIS OF WASTE TREATMENT SLUDGES FOR SALMONELLA SPECIES AS A SURVEILLANCE TOOL,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05B.
W73-10549

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HALOGENATED COMPOUNDS FOR THE SENSITIVE DETECTION OF CLOSTRIDIA BY GAS CHROMATOGRAPHY,
Yale Univ., New Haven, Conn. Div. of Health Science Resources.
B. M. Mitruka, and M. Alexander.
Canadian Journal of Microbiology, Vol 18, No 10, p 1519-1523, October 1972. 4 tab, 9 ref.

Descriptors: *Pollutant identification, *Anaerobic bacteria, *Clostridium, Alcohols, Organic acids, 2 4-D, 2 4 5-T, *Gas chromatography.
Identifiers: *Electron capture gas chromatography, *Cometabolism, Sensitivity, Substrates, Sample preparation, Metabolites, Culture media, Clostridium species, Chlorophenols, Methylphenoxyacetates, Hydrocarbons, Acetoin, n-Butanol, Isobutanol, Methanol, Valeric acid, Propionic acid, Isobutyric acid, Crotonic acids, Isopentanol, Diacetyl, Isovaleric acid, Acrylic acid, Pentanol, Butanediol.

Metabolites formed by the equivalent of 230 to 3000 cells of several Clostridium species were detected by use of a gas chromatograph fitted with an electron capture detector. A variety of organic acids, alcohols, and ketones were produced by growing cultures of the 10 species tested. Compounds excreted by 300 to 3000 cells of 12 strains of Clostridium perfringens were detected, and both common and dissimilar metabolites were formed by these strains. The sensitivity for detecting six Clostridium species increased up to several thousandfold when chlorophenoxyacetates were added to the medium, the increase being most marked with 2,4-di- and 2,4,5-trichlorophenoxyacetates. The results show that cometabolism is useful in increasing the sensitivity and speed of detection of Clostridium species. (Holoman-Battelle)
W73-10550

A STUDY TO IMPROVE DISSOLVED OXYGEN ANALYSIS TECHNIQUES TO FACILITATE WATER QUALITY FIELD SURVEY APPLICATIONS,
Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
R. W. Raible, and M. K. Testerman.
Available from National Technical Information Service as PB-221 019, $3.00 in paper copy, $0.95 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No 13, June 1973, 71 p, 22 fig, 22 tab, 4 ref. OWRR A-017-ARK (1). 14-31-0001-3804.

Descriptors: *Dissolved oxygen analyzers, *Dissolved oxygen, *Electrodes, *Instrumentation, Water quality, Water temperature, Pollutant identification.
Identifiers: Oxygen sensor, *Temperature compensated electrode.

Studies were made of the temperature characteristics of dissolved oxygen electrodes having a large surface area. Large area electrodes proved to have much longer lifetime between rejuvenations. Many measurements of dissolved oxygen in water need to be made in field situations where recalibration techniques would be difficult and where making temperature corrections is time consuming for operators who may be making numerous measurements. This study was directed toward design of a compensation circuit for a dissolved oxygen electrode which will give the best possible measurement over a large water temperature range of 5C - 35C without the necessity of recalibration. Studies were made of the temperature characteristics of dissolved oxygen probes and several electronic circuits with different configurations and components are described. Experimental data using two of the circuits are resported. One method involved using an integrated circuit multiplier module. The best temperature compensation was obtained for a circuit based on a design in which two thermistors were incorporated. (Roberson-Arkansas)
W73-10559

SODIUM AND MAGNESIUM SULFATE ION PAIRING: EVIDENCE FROM RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W73-10650

INORGANIC PHOSPHORUS IN SEAWATER,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W73-10680

A NETWORK FOR CONTINUOUS MONITORING OF WATER QUALITY IN THE SABINE RIVER BASIN, TEXAS AND LOUISIANA,
Geological Survey, Austin, Tex.
J. F. Blakey, and P. W. Skinner.
Geological Survey open-file report, May 1973. 37 p, 1 fig, 3 tab, 3 ref.

Descriptors: *Water quality, *Remote sensing, *Networks, *Monitoring, River basins, Texas, Louisiana, Data collections, Data transmissions, Control systems, Planning, Chemical analysis, Telemetry, Remote control, Network design, Methodology, Streamflow, Water temperature.
Identifiers: *Sabine River basin (Tex and La).

The proposed water-quality network for the Sabine River basin of Texas and Louisiana consists of nine monitoring stations, a central-control station, a slave-central station, and a leased-line telecommunications system. This monitoring network would provide continuous transmission of water-quality data to the office of the water manager. Level I operations at a proposed site would monitor current and potential problems, water-quality changes in subreaches of streams, and water-quality trends in time and place. Level II operations would monitor current or potential problems. An optimum system would require Level I operations at all nine stations. A minimum system would require Level II operations at most of the stations. (Woodard-USGS)
W73-10683

GEOHYDROLOGY,
Kennecott Copper Corp., Lexington, Mass.
For primary bibliographic entry see Field 04B.
W73-10790

TRACE ELEMENT ANALYSES OF COLUMBIA RIVER WATER AND PHYTOPLANKTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
C. E. Cushing, and L. A. Rancitelli.
Northwest Sci. Vol 46, No 2, p 115-121. 1972.
Identifiers: Neutron activation analyses, Asterionella-Formosa, *Columbia River, Fragilaria-Crotonensis, Melosira-Sp, Metals, Minerals, Phytoplankton, River, Seasonality, Synedra-Sp, Tabellaria-Sp, *Trace elements, Water.

Water and phytoplankton samples were collected upstream from the Hanford Atomic Works Project at 5 'ecologically significant' times of the year for analysis by neutron activation techniques. Collections were in Nov. (fall phytoplankton bloom), Feb. (mid. winter), April (spring phytoplankton bloom), June (summer high-water), and Aug. (summer stratification). Elements analyzed in the phytoplankton were: Ag, Br, Co, Cr, Cs, Fe, Hg, K, Na, Rb, Sb, Sc, Se and Zn. Additional elements analyzed in the water were: As, Au, Cu, Mn and U. Monthly samplings of phytoplankton and water were analyzed by standard methods for Ca, Mg, Na, K, Zn, Cu and P for comparison. Net plankton is dominated by Asterionella formosa and Fragilaria crotonesis with significant populations of Tabellaria sp., Synedra sp. and Melosira sp. Concentration factors of the elements in the phytoplankton are presented. Neutron activation techniques were shown to be clearly superior to conventional techniques for detection of micro quantities.--Copyright 1973, Biological Abstracts, Inc.
W73-10806

BACTERIAL IDENTIFICATION BY MICROCALORIMETRY,
Veterans Administration Hospital, Boston, Mass.
E. A. Boling, G. C. Blanchard, and W. J. Russell.
Nature, Vol 241, No 5390, p 472-473, February 16, 1973. 1 fig, 1 ref.

Descriptors: *Pollutant identification, Cultures, Streptococcus, E. coli, Speciation, Separation techniques.
Identifiers: *Microcalorimetry, Enterobacter aerogenes, Klebsiella, Proteus vulgaris, Enterobacter cloacae, Proteus rettgeri.

Seventeen species from 10 genera of Enterbacteriaceae were grown on brain-heart infusion (BHI) medium and analyzed by microcalorimetry as a means of differentiating species. The profiles were recorded on a strip chart recorder for periods up to 14 hrs. Using the curves, it was possible to discriminate between all the species tested. Profiles are included for Enterobacter aerogenes, Klebsiella, Proteus vulgaris, Enterobacter cloacae, Escherichia coli, and Proteus rettgeri. Streptococcus faecalis was also among the bacteria investigated. Microcalorimetry promises to be a rapid and specific means of characterization of Enterobacteriaceae and possibly other bacteria. (Little-Battelle)
W73-10848

OCCURRENCE OF SOME CHLORINATED ALIPHATIC HYDROCARBONS IN THE ENVIRONMENT,
The Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-10850

A SIMPLE MODIFICATION OF A FLAME PHOTOMETER FOR ROUTINE TRACE POTASSIUM ANALYSIS,
Bell Telephone Labs., Inc., Reading, Pa.
W. R. Knolle.
Applied Spectroscopy, Vol 27, No 2, p 142, March/April 1973. 1 fig, 4 ref.

Descriptors: *Potassium, *Aqueous solutions, *Chemical analysis, *Flame photometry, Pollutant identification, Instrumentation, Laboratory equipment, *Trace elements.
Identifiers: Trace levels, Detection limits.

A flame photometer was modified for potassium analysis in the ppb range in solution in order to avoid the cost and inconvenience involved in changing the grating and photomultiplier tube on a general purpose instrument. An instrumentation Laboratory model IL 153 atomic absorption spectrometer was used in the flame emission mode with an RCA 1P21 photomultiplier tube operated at 1200 V. The modification consisted of setting the grating of the spectrometer to zero wave length and using it as a mirror instead of as a monochromator. A first order least squares analysis of the data obtained from standards prepared with deionized water, which had been demineralized and filtered, yielded a correlation coefficient of 0.99991. Five 2-ml samples of dilute HF were analyzed for K, and the calculated standard deviation multiplied by a statistical factor yielded 1.1 mg of K as a detection limit. This easily realizable working limit is 2 orders of magnitude better than that achieved without the modification. This modification should be generally applicable to any emission flame photometer where the detection limit is restricted by photomultiplier tube and grating response. (Holoman-Battelle)
W73-10852

RAPID DETERMINATION OF VERY LOW NITROGEN LEVELS IN WATER,
California Univ., Davis. Dept. of Applied Science.
S. F. Bankert, S. D. Bloom, and F. S. Dietrich.
Nature, Vol 242, No 5395, p 270-271, March 23, 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Assay, *Water analysis, Methodology, *Pollutant identification, *Radioactivity techniques, Nutrients, *Nitrogen, Gamma rays, Chemical analysis, Potable water, Rivers, Municipal water, *Neutron activation analysis.
Identifiers: *Trace levels, Charged particle activation analysis, N-14, Nitrogen radioisotopes, Sensitivity, Detection limits, Lake Tahoe, Sacramento River, Accuracy.

A new approach to N-14 assay is associated with the evaporated detritus of less than 4 ml of water. This method, termed charge particle (nuclear) activation analysis (CPAA), has an activation and subsequent decay of minus 5.9 MeV and 71.0 s, respectively. The presence of nitrogen is measured by counting the number of 2.31 MeV gamma rays emitted in the decay reaction. The present overall accuracy is about plus or minus 25 percent at concentrations greater than 20 mg/kg; the test is sensitive down to 20 mg/kg. The testing time per sample is about 3 min without any destruction of the sample. The method has been applied to water samples from Lake Tahoe, the Sacramento River, municipal wells, and public drinking fountains. (Holoman-Battelle)
W73-10853

CHLORINATED HYDROCARBON PESTICIDES AND RELATED COMPOUNDS IN ADIPOSE TISSUE FROM PEOPLE OF JAPAN,
Environmental Protection Agency, Chamblee, Ga. Chamblee Toxicology Lab.
A. Curley, V. W. Burse, R. W. Jennings, E. C. Villanueva, and L. Tomatis.
Nature, Vol 242, No 5396, p 338-340, March 30, 1973. 4 fig, 2 tab, 13 ref.

Descriptors: Chemical analysis, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Pesticide residues, *Pollutant identification, Methodology, Dieldrin, DDT, Insecticides, Fungicides, Absorption, *Gas chromatography.
Identifiers: *Animal tissues, *Adipose tissue, Heptachlor epoxide, Isomers, Metabolites, Hexachlorobenzene, GC-Mass spectrometry, Column chromatography, Sample preparation, Gas liquid chromatography, Lindane, Japan, o p' DDE, p p' DDE, o p' DDT, p p' DDD, p p' DDT, Fat tissue, Electron capture gas chromatography, alpha-Hexachlorocyclohexane, gamma-Hexachlorocyclohexane, beta-Hexachlorocyclohexane, Bioaccumulation, Coulson conductometry, Electrolytic conductometric gas chromatography.

Japanese autopsy adipose tissue samples were analyzed by electron capture gas chromatography and the following chlorinated hydrocarbons were found: hexachlorobenzene (HCB), polychlorinated biphenyls, dichlorodiphenyl trichloroethane (DDT), dieldrin (HEOD), heptachlor epoxide, and the alpha, gamma, and beta isomers of hexachlorocyclohexane (HCCH). Two-column gas chromatography, Coulson conductometry and 'Florisil' elution patterns were accepted as sufficient confirmation for the presence of all reported compounds except hexachlorobenzene and PCBs. HCB was substantiated by electron capture and electrolytic conductometric gas-liquid chromatography and gas chromatography-mass spectrometry. The presence of PCB's was verified by electrolytic conductivity and gas chromatography-mass spectrometry. All samples analyzed were positive for PCBs. Eighty percent of the samples had a PCB concentration of less than 1.0 ppm. (Holoman-Battelle)
W73-10854

ORGANIC MERCURY COMPOUNDS IN COASTAL WATERS,
Connecticut Univ., Groton. Marine Sciences Inst.
W. F. Fitzgerald, and W. B. Lyons.
Nature, Vol 242, No 5398, p 452-453, April 13, 1973. 2 tab, 18 ref.

Descriptors: *Mercury, *Pollutant identification, Rivers, Heavy metals, Chemical analysis, Water analysis, Sea water, Trace elements, Water sampling.
Identifiers: *Coastal waters, *Organic mercury, *Flameless atomic absorption spectrophotometry, Metal complexes, Sample preparation, *Long Island Sound, Photooxidation.

Determinations of total and inorganic mercury were made on coastal and river waters near Long Island Sound. Two different 100-ml sets of samples were collected in glass bottles and acidified to pH 1.0 with redistilled concentrated nitric acid. One set was analyzed immediately for inorganic Hg; the other was photooxidized for 24 hr and aliquots were analyzed for total Hg. Flameless atomic absorption spectrophotometry was used in both cases. The total Hg concentrations were 0.045-0.078 ppb and those of inorganic Hg were 0.021-0.033 ppb. It is significant that as much as 50-60 percent of the mercury present in those waters may exist either as organic compounds or in association with organic matter. (Holoman-Battelle)
W73-10855

FROZEN PREPARED MICROBIOLOGICAL CULTURE MEDIA,
Philadelphia Coll. of Pharmacy and Science, Pa. Dept. of Bacteriology.
B. Witlin.
Mycopathologia et Mycologia Applicata, Vol 49, No 2-3, p 137-139, March 15, 1973. 8 ref.

Descriptors: *Storage, *Bacteria, *Freezing, Cultures, Microbiology.
Identifiers: *Culture media, *Agars, *Broths, Nutrient broth, Nutrient agar, Nutrient gelatin, Trypticase soy broth, Trypticase soy agar, Trypticase soy blood agar, Endo agar, E.B.M. agar, MacConkey agar, Russell's double sugar agar, Triple sugar iron agar, Sabouraud broth, Sabouraud agar, M.R.-V.P. broth, Dunham's peptone solution, Purple milk, Litmus milk, Littman agar, Chocolate agar, Martin-Lester transgrow media, Loeffler's media, Lowenstein-Jensen media, Thioglycollate broth, Phenol red broth, Mannitol, Arabinose, Xylose, Glycerol, Rhamose, Trehalose.

Thirty culture media were stored in a freezer at minus 5 C and minus 20 C and evaluated at weekly intervals for periods of one year. After storage, the media were removed, ovserved for physical appearance, thawed at room temperature, inoculated with test organisms (Streptococcus, Staphylococcus, Enterobacter, Salmonella, Pseudomonas, Proteus, Candida, Trichophyton, Neiserria, Corynebacterium, Mycobacterium) and incubated. With the exception of blood agar, the frozen and thawed media were satisfactory with regard to appearance, consistency, and as a substitute for biochemical reactions. Consequently, single freezing of culture media provides a practical and convenient method for preserving and storing noncellular substrates for long periods. (Little-Battelle)
W73-10857

AGAR-PLUG CUTTER AND INOCULATION DEVICE,
Western Regional Research Lab., Berkeley, Calif.
R. H. Kurtzman, Jr.
Mycologia, Vol 65, No 1, p 236-239, January-February 1973. 3 fig, 5 ref.

Descriptors: *Laboratory equipment, Cultures, Design, Microbiology, Methodology.
Identifiers: *Agar-plug cutter, *Inoculation, Agars.

An agar-plug cutting device is described which can be made in a wide variety of sizes and can be sterilized by any ordinary means. The device is constructed from a cutoff No. 18 syringe needle, a serum stopper, and an antibiotic assay cup or other short length of stainless steel tubing. The tubing which serves as a cutter is drilled lengthwise to allow the syringe needle to be inserted. A second, larger hole is drilled lengthwise in the tubing, but only to a depth of about 2 mm. The serum stopper is placed over the needle to provide an air-tight seal so that when the cutter is inserted into the agar, the vacuum created by withdrawing the needle will retain the plug in the tubing. The needle is also used to eject the plug onto the plate to be inoculated. A control unit was also developed to improve the use of the device. Using the completed device, it was possible to inoculate 50 plates in 10 minutes. (Little-Battelle)
W73-10858

SLIME-INHABITING GEOFUNGI IN A POLLUTED STREAM (WINTER/SPRING),
Washington Univ., St. Louis, Mo. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-10859

MICRODETERMINATION OF FORMIC, OXALIC AND ACETIC ACIDS IN THEIR MIXTURE BY SELECTIVE OXIDATION,
Allahabad Univ. (India). Chemistry Labs.
P. K. Jaiswal.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 335-336, March 6, 1973. 3 ref.

Descriptors: *Chemical reactions, Methodology, Organic acids, Oxidation, Chemical analysis, Pollutant identification.
Identifiers: *Oxalic acid, *Acetic acid, Mixtures, *Formic acid, Silver, Ditellurato argentate, Diperiodato cuprate, Chemical interference, Accuracy, Precision, Ditellurato cuprate, Reagents.

Formic, oxalic and acetic acids have been determined in their mixture by selective oxidation with Ag (III) and Cu (III) reagents. Ag (III) oxidizes only formic acid under specific conditions. Diperiodato cuprate (III) solution oxidizes only formic and oxalic acids under verified conditions, whereas ditellurato cuprate (III) solution oxidizes formic, oxalic as well as acetic acids. Thus by the use of these three oxidants the three acids can be determined separately in their mixture. Formic, oxalic and acetic acids require 2, 2 and 8 equivalents of oxidant for their complete oxidation. The quantities of the three acids have been calculated in g.mole. Experiments have been repeated several times with about 0.00002-0.00006 g.moles of substance and results are obtained with plus or minus 0.8 percent deviation. Interferences are observed in the presence of other inorganic and organic substances. (Holoman-Battelle)
W73-10860

SEPARATION AND PRECONCENTRATION,
Leeds Univ. (England). School of Chemistry.
H. Irving.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 264-271, March 6, 1973. 5 fig, 3 tab, 62 ref.

Descriptors: *Separation techniques, *Water analysis, *Organic compounds, *Aqueous solutions, *Heavy metals, Ion exchange, Evaporation, Reverse osmosis, Adorption, Absorption, Sea water, Mercury, Pesticides, Lead, Iron, Waste water (Pollution), Gold Aluminum, Cobalt, Manganese, Nickel, Chromium, Cadmium, Magnesium, Beryllium, Molybdenum, Neutron activation analysis, Gas chromatography, Sodium, Potassium, Froth flotation, Chelation, Foam fraction, Distillation, Cesium, Strontium.

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Identifiers: *Preconcentration, *Biological samples, Molecular sieves, Freeze concentration, Volatilization, Coprecipitation, Gel filtration, Gel permeation, Ultrafiltration, Electrophoresis, Sublimation, Partition chromatography, Scavenging, Gas solid chromatography, Sr-90, Y-90, Cs-137, Tellurium, Amalgamation, Masking, Chemical interference, Ashing, Sample preparation, Liquid-liquid extraction, Electrodeposition, Adsorbents, Uranium, Silver, Antimony, Bismuth, Gallium, Zirconium, Hafnium, Scandium, Lanthanum, Cerium, Tungsten, Indium, Vanadium, Paper chromatography, Thin layer chromatography, Silylation, Abate, Detection limits, Rubidium, Yttrium.

A general review is given of methods for separation and preconcentration of analytes. Among the methods of preconcentration reviewed are ashing, evaporation, freeze concentration, froth flotation, reverse osmosis, adsorption, liquid-liquid extraction, amalgam methods, volatilization, electrodeposition, and ion exchange. Separation methods reviewed included molecular sieves, gel filtration, gel permeation, gaseous diffusion, ultrafiltration, electrophoresis, sublimation, distillation, foam fractionation, absorption chromatography, gas-solid chromatography, scavenging by colloids, crystallization, freeze separation, zone refining, paper, partition, and thin layer chromatography, liquid-liquid extraction, ion exchange, electrodeposition, amalgam methods, and masking and demasking. Several of the techniques are discussed in relation to analysis of water for heavy metals, organic compounds, and other contaminants. (Little-Battelle)
W73-10861

NEW METHODS FOR THE DETERMINATION OF ELEMENTS IN TRACE AMOUNTS,
Birmingham Univ. (England). Dept. of Chemistry.
R. Belcher.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 257-263, March 6, 1973. 8 fig, 25 ref.

Descriptors: *Methodology, *Pollutant identification, Mass spectrometry, Chemical reactions, Anions, Cations, Cobalt, Sulfates, Spectrophotometry, Nitrites, Volumetric analysis, Nitrates, Bromides, Iodides, Chlorides, Phosphates, Molybdenum, Heavy metals, Silicates, Amino acids, Polarographic analysis, Manganese, Lead, Halogens, Phosphorus, Sulfur, Nitrogen, *Trace elements, Catalysts, Copper, Nickel, Alkali metals, Separation techniques, Chemical analysis, Titanium.
Identifiers: *Trace levels, *Chemical elements, Molecular emission spectroscopy, Metal chelates, Gas liquid chromatography, Enzymatic techniques, Candoluminescence, Reagents, Chemical indicators, Detection limits, Chemical interference, Ionic interference, Sensitivity, Apoenzymes, Charge transfer reactions, Palladium, Arsenates, Vanadates, Complexation, Atomic absorption spectrophotometry, Bismuth, Antimony, Rare earth elements, Arsenic, Selenium, Tellurium, Polyphenol oxidase, Platinum, Mass spectra, Hafnium, Zirconium.

Recent methods for the determination of elements in trace amounts are discussed, which have been mainly developed in the author's laboratories. The review comprises the following sections: reagents and reactions, charge transfer reactions, candoluminescence, molecular emission spectroscopy in flames, enzymatic methods, gas-liquid chromatography of metal chelates, and mass spectrometry of metal chelates. (Holoman-Battelle)
W73-10862

TITRIMETRIC MICRODETERMINATION OF NICKEL AND COBALT, SEPARATELY AND IN PRESENCE OF EACH OTHER,
Allahabad Univ. (India). Chemistry Labs.
S. Saxena, and J. D. Pandey.
Zeitschrift fur Analytische Chemie, Vol 263, No 3, p 208, February 7, 1973.

Descriptors: *Nickel, *Cobalt, *Volumetric analysis, *Pollutant identification, Heavy metals, Cations, Alkaline earth metals, Chemical analysis, Lead, Iron, Aluminum, Magnesium, Cadmium, Beryllium, Calcium, Zinc, Dyes.
Identifiers: *Ionic interference, Chemical indicators, Accuracy, Rare earth elements, Sensitivity, Chemical interference, Gallium, Neodymium, Gadolinium, Tellurium, Niobium, Rhenium, Thallium, Barium, Indium, Praseodymium, Uranium, Xylenol orange, Hippuric acid, Chromazurol red S.

A new method for the determination of Ni and Co, separately and in mixture is based on titration with hippuric acid. Xylenol orange (and chromazurol red S) are employed as indicators. Maximum error observed for Ni and Co was 2.0 percent and 1.9 percent, respectively, when determined separately and 1.9 percent and 1.9 percent, respectively, when determined from a mixture. Amounts taken were in the range of about 60-400 mg. The following ions caused interferences: Pb, Fe, Ga, Al, Nd, Gd, Zr, Te, Nb, Re. No interferences are caused by Tl, Mg, Cd, Be, Ca, Ba, Zn, In, Pr, U. A most important precaution in this method is a thorough cleaning of the beakers used with sodium carbonate or chromic acid, since otherwise the exact color change may not be obtained. (Holoman-Battelle)
W73-10863

THE DISTRIBUTION OF HEAVY METALS IN SEDIMENTS OF SORFJORD, WEST NORWAY,
Edinburgh Univ. (Scotland). Grant Inst. of Geology.
For primary bibliographic entry see Field 05B.
W73-10865

OXYGEN DEMAND OF EFFLUENT FROM A BLEACHED KRAFT PULP MILL,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
J. G. Ogden, III.
Water, Air, and Soil Pollution, Vol 1, No 4, p 365-374, September 1972. 1 fig, 6 tab, 9 ref.

Descriptors: *Oxygen demand, *Effluents, *Pulp and paper industry, Chemical oxygen demand, Biochemical oxygen demand, Organic loading, Water sampling, Water chemistry, Gas chromatography, Industrial wastes, *Pulp wastes, Aeration, Mechanical control, Hydrogen ion concentration, Water properties, Color, Sulfates, Hydrogen sulfide, *Chlorides, Sea water, Suspended solids, Dissolved solids, *Canada.
Identifiers: Characterization, *Bleached pulp wastes, Gravimetric analysis, Total oxygen demand, Settleable solids, Transparency.

Since the fall of 1967, a 160 hectare former tidal estuary has been dammed and used as a waste water treatment facility for a 500-700 metric tons per day bleached sulfate kraft pulp mill at Abercrombie Point, Nova Scotia. The treatment system is subdivided into a 16 hectare settling pond to remove coarse suspended solids, and a 144 hectare stabilization pond. Volume of the two basins indicates a total detention time of 15 to 25 days, depending upon plant flow rates. Total solids input to the treatment system (determined by evaporation at 105 C) amounts to 1.29 g/l. Settling and oxidation in the basin accounts for approximately 0.29 g/1. Because of plant flow rates of 95 million per day, nearly 100 metric tons of solids are released to the marine environment daily. Determinations indicate that at present loadings, more than 10 metric tons of BOD per day are entering a poorly flushing coastal environment. Chemical Oxygen Demand (COD) values are from 2 to 10 times greater than BOD. Effects of mechanical aeration and massive lime treatment of the effluent for removal of solids and 02 demand are discussed. Consequences of alternative treatment methods and continued utilization of the treatment basin are considered. (Holoman-Battelle)
W73-10868

EFFECT OF SEAWATER SOLUBLE FRACTION OF KEROSENE ON CHEMOTAXIS IN A MARINE SNAIL, NASSARIUS OBSOLETUS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-10872

HALOGENATED HYDROCARBONS IN AND OVER THE ATLANTIC,
Reading Univ. (England). Dept. of Applied Physical Sciences.
For primary bibliographic entry see Field 05B.
W73-10873

VIBRIO PARAHAEMOLYTICUS METHODOLOGY FOR ISOLATION FROM SEAFOODS AND EPIDEMIC SPECIMENS,
Food and Drug Administration, Washington, D.C. Bureau of Foods.
M. Fishbein, and B. Wentz.
Journal of Milk and Food Technology, Vol 36, No 2, p 118-123, February 1973. 5 fig, 4 tab, 7 ref.

Descriptors: *Pathogenic bacteria, *Isolation, *Analytical techniques, Methodology, Pollutant identification, Marine bacteria, Public health, Human diseases, Enteric bacteria, Anaerobic bacteria, Fish, Shellfish, Crustaceans, Marine animals, Epidemics.
Identifiers: *Vibrio parahaemolyticus, *Seafood, *Feces, Culture media, Biochemical tests, Vibrio alginolyticus, Marine environment, Selective media, Enrichment.

The newly revised procedure in the Bacteriological Analytical Manual of the Food and Drug Administration for the analysis of Vibrio parahaemolyticus in seafood samples and epidemic specimens, media and test regeant formulations, enrichment and isolation procedures, and the biochemical and serological diagnostic criteria of Vibrio parahaemolyticus are presented. The biochemical schema for the separation of other interfering marine vibrios is included. (Holoman-Battelle)
W73-10874

REDUCTION OF MERCURY WITH CYSTEINE IN COMMINUTED HALIBUT AND HAKE FISH PROTEIN CONCENTRATE,
National Marine Fisheries Service, Seattle, Wash. Pacific Fishery Products Technology Center.
For primary bibliographic entry see Field 05C.
W73-10878

A STUDY OF CILIATE PROTOZOA FROM A SMALL POLLUTED STREAM IN EAST-CENTRAL ILLINOIS,
Maryland Univ., College Park. Dept. of Zoology.
For primary bibliographic entry see Field 05D.
W73-10886

A BIOLOGICAL EVALUATION OF THE MOLYBDENUM BLUE METHOD FOR ORTHOPHOSPHATE ANALYSIS,
Wisconsin Univ., Madison. Water Chemistry Program.
C. P. Walton, and G. F. Lee.
Verhandlungen der Internationalen Vereiningung fur Theoretische Limnologie, Vol 18, p 676-684, 1972. 5 fig, 2 tab, 9 ref.

Descriptors: *Analytical techniques, *Measurement, *Phosphates, Nutrients, Algae, Bioassay, Plant growth, Laboratory tests.
Identifiers: *Molybdenum blue method, *Orthophosphate, Lake Mendota (Wis).

One of the primary utilities of orthophosphate measurements is to estimate the concentration of

biologically available phosphorus, thus it is essential that the relationship between the soluble orthophosphate concentrations determined by the molybdenum blue method and the soluble phosphate concentrations that are available as plant nutrients be known. This investigation compares the soluble reactive molybdenum blue phosphorus present in water samples to the amount of algal growth as achieved in a standardized bioassay procedure where the growth is limited by the phosphorus concentration present in the sample. The Lake Mendota waters tested were fortified with the nutrients contained in the Provisional Algal Assay Procedure media such that the growth of the test organism would be limited by the amount of phosphorus available in the test water. There was no discrepancy between the amounts of growth of the test organisms in the lake water, sediment extracts, and algal detritus extracts predicted by the molybdenum blue soluble orthophosphate and the growth of the test organism in the test media with a corresponding amount of soluble orthophosphate added. It is recommended that both chemical and biological tests be applied before extensive reliance is made on the molybdenum blue method. (Jones-Wisconsin)
W73-10943

TRACE METALS IN CORES FROM THE GREAT MARSH, LEWES, DELAWARE.
Delaware Univ., Newark. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-10971

ON THE ISOLATION AND THE BACTERIOLYTIC ACTIVITY OF SOME MYXOBACTERIA ISOLATED IN WATER (SUR L'ISOLEMENT ET L'ACTIVITE BACTERIOLYTIQUE DE QUELQUES MYXOBACTERIES ISOLEES DE L'EAU),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
J. Raverdy.
Water Research, Vol 7, No 5, p 687-693, May 1973. 4 tab, 21 ref.

Descriptors: *Isolation, *Cytological studies, *Pollutant identification, Water sampling, Methodology, Water pollution, Rivers, E. coli.
Identifiers: *Myxobacteria, *Fate of pollutants, *Bacteriolytic activity, Gram-negative bacteria, Gram-positive bacteria, Biochemical characteristics, Bacteriolysis, Salmonella species, Arizona, Shigella dysenteriae, Proteus species, Providencia, Klebsiella pneumoniae, Enterobacter cloacae, Citrobacter freundii, Hafnia, Serratia, Pseudomonas species, Acinetobacter species, Vibrio species, Staphylococcus species, Bacillus species.

Four strains of Myxobacteria were isolated in samples of river water. Their bacteriolytic activity was studied in relation to 24 strains of Gram-negative bacilli and 10 strains of Gram-positive bacteria. Their morphology and cultural characteristics are described and their role in the phenomena of self-purification is discussed. (Holoman-Battelle)
W73-10999

EXPERIMENTAL TREATMENT OF SURFACE WATER PURIFICATION BY LAGOONS: CHEMICAL AND MICROBIOLOGICAL ASPECTS, (TRAITEMENT EXPERIMENTAL D'EPURATION D'UNE EAU DE SURFACE PAR LANUNAGE: ASPECTS CHIMIQUES ET MICROBIOLOGIQUES),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 05B.
W73-11000

ECOLOGY OF VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY,
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11001

EVALUATION OF COLIFORM TESTS FOR CHLORINATED SECONDARY EFFLUENTS,
Illinois State Water Survey, Peoria. Water Quality Section.
S. Lin.
Journal Water Pollution Control Federation, Vol 45, No 3, p 498-506, March 1973. 5 fig, 4 tab, 10 ref.

Descriptors: *Cultures, *Chlorination, *Separation techniques, Sewage effluents, Coliforms, Pollutant identification, *Illinois, Waste water treatment, Treatment facilities.
Identifiers: *Fecal coliforms, *Membrane filter, Most probable number test, Method evaluation.

The purpose was (1) to determine whether or not the LES two-step enrichment MF technique for total coliforms assay on chlorinated effluents is comparable to the recommended MPN method and (2) to compare fecal coliform detection by M-FC MF technique on chlorinated secondary effluents with the MPN procedure. Grab samples of secondary effluent were collected from three Illinois treatment plants, chlorinated with up to 6 mg/l of chlorine, stirred, dechlorinated after various periods of contact by sodium thiosulfate, and assayed. The results showed that the LES two-step MF procedure is comparable to the completed MPN techniques for total coliform detection in chlorinated secondary effluents. Total coliform recovery in chlorinated effluent by the LES two-step MF technique was approximately 1.5 times that observed using the M-Endo, one-step MF procedure. Fecal coliform recovery using the M-FC MF technique on chlorinated effluent was less than that obtained using confirmed MPN in EC broth. Estimates of MPN densities in chlorinated secondary effluent might be useful from currently acceptable MF procedures by using a mathematical relationship similar to log MPN equals to 1.062 log MF minus 0.014. (Little-Battelle)
W73-11002

EDAPHIC FACTORS OVERRIDE A POSSIBLE GRADIENT OF ECOLOGICAL MATURITY INDICES IN A SMALL STREAM,
North Carolina Univ., Chapel Hill. Dept. of Botany.
A. F. Motten, and C. A. S. Hall.
Limnology and Oceanography, Vol 17, No 6, p 922-926, November 1972. 2 fig, 20 ref. OWRR B-007-NC (7).

Descriptors: *Trophic level, *Respiration, *Primary productivity, *Pigments, Ecology, Dissolved oxygen, Spectrophotometry, Separation techniques, Benthos, *North Carolina.
Identifiers: Sample preparation, *New Hope Creek (NC), *Edaphic factors.

The objective was to apply Margalef's (1963, 1965) maturity indices to two regions of New Hope Creek, North Carolina to test the hypothesis that upstream regions are less ecologically mature than downstream regions. Two parameters were measured at three locations in the streams: pigment ratios, or the ratios of the optical densities at 430 and 665 millimicrons, and the ratio of gross productivity to community respiration (P:R). Oxygen was measured by both the Winkler method and a galvanic probe recorder. Pigment analyses were based on random samples of benthic communities. These samples were centrifuged, ground in acetone, and the absorbance of the extracted pigment read on a spectrophotometer. Within the limited scope of this study no support was found for the original proposition that the upstream region of the stream was less ecologically mature than the downstream region. If differences in ecological maturity do exist between the two sites studied, they are not properly measured by pigment ratios or P:R ratios, or, more probably, they are overridden by local or edaphic factors. (Little-Battelle)
W73-11003

A PRELIMINARY INVESTIGATION OF ORGANIC-INORGANIC ASSOCIATIONS IN A STAGNATING SYSTEM,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-11004

PHYTOPLANKTON OBSERVATIONS IN THE EASTERN CARIBBEAN SEA,
Old Dominion University, Norfolk, Va. Dept. of Biology.
H. G. Marshall.
Hydrobiologia, Vol 41, No 1, p 45-55, February 28, 1973. 1 fig, 3 tab, 9 ref.

Descriptors: *Marine algae, *Phytoplankton, Nannoplankton, Chrysophyta, Cyanophyta, Pyrrophyta, Ecological distribution, Dominant organisms, Diatoms, Nansen bottles, Hydrography, Water sampling, Dinoflagellates, Water temperature, Dissolved oxygen, Depth.
Identifiers: *Caribbean Sea, Silicoflagellates, Coccolithophores, Species diversity, Flagellates, Sample preservation, Amphiprora, Amphora, Caloneis, Cocconeis, Diploneis, Fragilaria, Pleurosigma, Amphidinium, Gonyaulax, Phalacroma, Asterolampra marylandica, Bacteriastrum comosum, Biddulphia mobiliensis, Cerataulina pelagica, Chaetoceros species, Coscinodiscus species.

In order to obtain phytoplankton and hydrographic data, water samples were taken at 11 sites along transects in Caribbean Sea on two different cruises, January 1969 and January 1970, west of the Lesser Antilles. Another series of collections were made off the coast of Venezuela (January 1968). A total of 88 taxa were noted in these samples, of which there were 44 diatoms, 41 pyrrhophyceans, 2 cyanophyceans and 1 silicoflagellate. Totals of 37 and 38 different phytoplankters were observed during cruises E46K-67-68 and E1-C-70, respectively, with 58 species noted in the extensive samplings of E 50D-68-69. A diatomaceaous flora predominated in each series of collections. The phytoflagellates were well represented, but in low numbers. The overall phytoplankton concentrations were low for each of the areas studied during these three January cruises. Even the preliminary data on the coccolithophore concentration do not indicate a major development at this time of the year. The present results indicate a substantial contribution made by the nannoplankton. In this series of January collections they consisted predominately of the diatom Melosira sp. In these offshore waters various species of the genus Rhizosolenia were most abundant. Only one bloom condition was noted and this consisted of Noctiluca scintillans. There were 13 phytoplankters found during each of the three cruises, having a distribution that extended over the eastern Caribbean. These were the diatoms, Coscinodiscus sp., Rhizosolenia alata, R. hebetata semispina, Navicula sp., Thalassiothrix frauenfeldii, Pleurosigma sp., and the pyrrohophyceans, Ceratium fusus, C. trichoceros, C. tripos, Podolampas spinifera. These were in addition to Dictyocha fibula, Skujaella thiebantii, and Richelia intracellularis. (Holoman-Battelle)
W73-11006

GROWTH OF A FLOATING AQUATIC WEED, SALVINIA UNDER STANDARD CONDITIONS,
Makerere Univ., Kampala (Uganda). Dept. of Botany.
For primary bibliographic entry see Field 05C.

UNIV. OF ILL. URBANA-CHAMPAIGN

W73-11007

A ZOOGLOEA BACTERIUM WITH GELATINOUS MUCOPOLYSACCHARIDE MATRIX,
Tokyo Metropolitan Univ. (Japan). Dept. of Biology.
Y. Tezuka.
Journal Water Pollution Control Federation, Vol 45, No 3, p 531-536, March 1973. 2 fig, 2 tab, 26 ref.

Descriptors: *Pollutant identification, *Cultures, *Separation techniques, *Activated sludge, Systematics, Chromatography.
Identifiers: *Zoogloea, Culture media, Paper chromatography, Characterization, Amino sugars, N-acetylglucosamine, N-acetylfucosamine.

A zoogloea-forming bacterium was isolated from activated sludge and identified tentatively as belonging to the genus Zoogloea. The bacterium grew in liquid media with the formation of amorphous gelatinous colonies in which the bacterial cells were sparsely embedded. The gelatinous substance was isolated and purified partially: it was a mucopolysaccharide composed primarily of two amino sugars. One of these sugars was identified as N-acetylglucosamine, and the other was suggested to be N-acetylfucosamine. The molar ratio of the former to the latter was approximately 1:2. The polymer was quite resistant to the action of the microfloras from wastewater and soil. (Little-Battelle)
W73-11009

PHAGE-TYPING OF STAPHYLOCOCCUS AUREUS,
Central Public Health Lab., London (England).
M. T. Parker.
In: Methods in Microbiology, Vol 7B, Academic Press, New York. 1972. p 2-28, 2 fig, 4 tab, 51 ref.

Descriptors: *Separation techniques, *Pollutant identification, Cultures, Methodology, Laboratory equipment, *Systematics, *Bacteriophage.
Identifiers: *Phage typing, Data interpretation, Culture media, *Staphylococcus aureus, Phages.

This chapter of 'Methods in Microbiology' discusses the historical development and present technical methods of phage typing as a means of distinguishing Staphylococcus aureus, interpretation of results from phage typing, staphylococci from domestic animals, taxonomic significance of phage typing, and the future potential of the method. The section on technical methods thoroughly reviews the media and conditions of growth, propagation and testing of phages, typing, and reading and reporting of results. The section on interpretation discusses the range and causes of variability and long-term changes in typing patterns. (Little-Battelle)
W73-11012

DETECTORS FOR MEASUREMENT OF WATER POLLUTION.

Process Biochemistry, Vol 8, No 3, p 31-33, March 1973. 1 fig.

Descriptors: *Measurement, *Water pollution, *Monitoring, *Instrumentation, Methodology, Automatic control, Pollutant identification, Water quality control, Automation, Turbidity, Cations, Anions, Hardness (Water), Sodium, Hydrogen, Potassium, Nitrates, Calcium, Fluorides, Chlorides, Bromides, Iodides, Sulfur, Cadmium, Lead, Sulfates, Ion exchange.
Identifiers: *Detectors, *Sensors, Ion selective electrodes, Membrane electrodes, Ammonia electrodes, Detection limits, Chemical interference, Ionic interference, Borotetra-fluorides, Cyanides, Perchlorates, Silver, Thiocyanates, Ion exchange electrodes, Organic carbon.

A symposium was held in January at the Electronics Division of the Institution of Electrical Engineers. Papers presented by representatives from instrument companies, the Water Resources Board, the Department of the Environment, the Water Research Association and River Authorities covered the following topics or areas of interest: (1) 'Improvements to the Organic Carbon Monitor', (2) 'Recent Developments in Sensors and Systems for Monitoring Water Quality', (3) 'The Application of Gas Permeable and Selective Ion Electrodes to Continuous Water Quality Monitoring', (4) 'The Use of an Ammonia-Sensitive Membrane Electrode', (5) Application of Atmospheric Turbidity Monitoring Techniques to Water Turbidity Monitoring', (6) 'Automatic Monitoring of River Water Quality', (7) 'Some Operational Problems Associated with River Water Quality Monitors', (8) 'Practical Experiences in River Water Quality Monitoring'. (Holoman-Battelle)
W73-11016

TOXICITY, RESIDUE DYNAMICS, AND REPRODUCTIVE EFFECTS OF PHTHALATE ESTERS IN AQUATIC INVERTEBRATES,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 05C.
W73-11020

SOME TRACE ELEMENT CONCENTRATION VARIATIONS OBSERVED IN MARINE ORGANISMS THAT SUGGEST CAUTION IN SAMPLING,
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Marine Radioactivity Lab.
T. R. Folsom, V. F. Hodge, K. M. Wong, R. Kishore, and V. P. Guinn.
Report No. TID-26198, May 24-26, 1972. 14 p, 1 fig, 8 tab, 1 ref.

Descriptors: *Bioindicators, *Mercury, *Zinc, *Lead, Heavy metals, *Marine fish, *Trace elements, Invertebrates, Kelps, Marine algae, Clams, Mollusks, Snails.
Identifiers: *Data interpertation, *Selenium, *Bioaccumulation, Albacore tuna, Dolphins, Polonium, Scandium, Horse clam, Bubble snail, Turban snail, Sea hare, Skipjack tuna, Elk kelp, Biological samples, Macroinvertebrates, Pb-210, Po-210, Pelagohycus porra, Spleen, Kidneys, Tail fin, Liver, Bone, Gills, Heart, Stomach contents, Brain, Flesh, Muscle, Skin, Gall bladder, Eyes, Thunnus alalunga, Katsuwonus pelamis, Blood, Norrisia norrisi, Bulla gouldiana, Tresus nuttallii, Aplysia californica, Ovaries, Testes, Spermalotheca, Body fluids, Genital duct.

Data were accumulated on accumulations of Hg, Se, Zn, Pb, Pb-210, and Po-210 in elk kelp, Zn, Se, and Po-210 in albacore, Po-210 in skipjack, Po-210, Pb-210, Hg, Se, and Zn in dolphins, and Po-210 in horse clams, bubble snails, brown turban snails and sea hares. Analysis of these data shows that concentrations of metals vary greatly from one organ to another. If whole-body residues or residues in organs not specific for certain elements are measured, errors much larger than those from analytical procedure may result. Consequently, it is only possible to draw valid conclusions from data which have been obtained with normal, averaged, or otherwise standardized conditions. (Little-Battelle)
W73-11021

FAST LIQUID CHROMATOGRAPHY,
Kyoto Univ. (Japan). Faculty of Science.
H. Hatano.
Research/Development, Vol 24, No 4, p 28-32, April 1973. 11 fig, 14 ref.

Descriptors: *Instrumentation, *Laboratory equipment, Research equipment, *Organic compounds, *Automatic control, *Chemical analysis, *Pollutant identification, Amino acids, Automation, Separation techniques, Selectivity, Aromatic compounds, *Chromatography.
Identifiers: High speed liquid chromatography, Spectrophotofluorimeter, Automatic amino acid analyzer, Ultraviolet absorption detector, Differential refractometric detector, Flow spectrophotofluorimetric detector, Gel permeation chromatography, Spectrophotometric detector, Biological samples, Sensitivity, Liquid chromatography, Hitachi 634 liquid chromatograph, Hitachi KLA-5 amino acid analyzers, Naphthalene, Phenathrene, Pyrene, Triphenylene, Chrysene, Anthracene, 1 2-Benzanthracene, 1 2-Benzopyrene, Uridine, 2 3-Benztriphenylene, Guanosine, Adenosine, Cytidine, Benzene, Benzothiophene, Dibenzothiophene, Chromatographic columns.

Instrumentation developed in Japan is described, including the latest chromatographs and detectors available. The specific equipment is: (1) an automatic liquid chromatograph, consisting of a chromatographic separation system which utilizes an automatic fractionation mode, a two-wavelength spectrophotometric detector, and an automatic operation system; (2) an automatic amino acid analyzer equipped with three constant-flow delivery pumps and a three-wavelength flow photometric detector in continouous flowing mode; (3) an automatic liquid chromatograph equipped with a three-wavelength flow-spectrophotometric detector selective to wavelengths of 200 and 750 nm; (4) a high speed liquid chromatograph equipped with a high efficiency column for gel-permeation chromatography. It has also been equipped with a differential refractometer operating on Fresnell's principle; and (5) the FLC-1 fast chromatograph equipped with a flow spectrophotofluorimeter. The ultraviolet absorption, differential refractometric, and flow spectrophotofluorimetric detectors have been used with this equipment. Hitachi KLA-5 amino acid analyzers have been used for accelerated analyses of amiono acids and related ninhydrin compounds. The Hitachi 634 liquid chromatograph has been used for other organic and biological compounds. (Holoman-Battelle)
W73-11022

DETECTION OF ORGANO-PHOSPHORUS PESTICIDE RESIDUES IN AUTOPSY TISSUES BY THIN-LAYER CHROMATOGRAPHY,
Chemical Examiner's Lab., Agra (India) Toxicology Div.
S. N. Tewari, and S. P. Harplani.
Mikrochimica Acta, Vol 2, p 321-324, March 1973. 1 tab, 23 ref.

Descriptors: *Separation techniques, *Solvents, *Diazinon, Pesticides, *Pesticide residues, Phenols, Pollutant identification, Organophosphorus pesticides, Phosphothioate pesticides, *Chromatography.
Identifiers: *Thin layer chromatography, *Liver, *Sample preparation, Ethyl parathion, Methyl parathion, Meta-systox, p-Nitrophenol, Tissue, Biological samples, Organic solvents, Benzene, Malathion, Nitrophenol.

A method of extracting organophosphorus pesticides from postmortem human tissues (liver), and their separation and identification by thin-layer chromatography are described. The respective metabolites are also separated. The insecticides used as controls were: ethyl parathion, methyl parathion, malathion, diazinon and meta-systox. The liver sample was extracted by homogenizing with anhydrous sodium sulfate and redistilled acetone, filtering, evaporating the solution, extracting the residue with n-hexane, and partitioning with acetonitrile. After evaporation of the acetonitrile layer, the residue was dissolved in ethanol for spotting on thin layer plates. Four solvent systems were evaluated: cyclohexane-acetone (40:5 and 40:15), cyclohexane-ethylmethyl

ketone (40:1), and benzene. Benzene was suitable for separation of ethyl parathion, methyl parathion, malathion, diazinon and meta-systox on silica gel thin layers. Rhodamine B was used as the detection reagent. Other solvents were superior for separation of mixtures of metabolites of some of these pesticides. (Little-Battelle)
W73-11023

TRACING OIL AS A POLLUTANT IN WATER,
Environmental Protection Agency, Redmond, Wash. Regional Lab.
N. J. Malueg, and D. F. Krawczyk.
Journal of Petroleum Technology, Vol 25, p 243-248, March 1973. 1 fig, 9 tab, 16 ref.

Descriptors: *Tracking techniques, *Oil spills, Water pollution sources, *Pollutant identification, Methodology, *Water analysis, Oil pollution, Oily water, Gas chromatography, Sulfur, Chemical analysis, Iron, Nickel, Zinc, Heavy metals, Solvent extractions, Separation techniques.
Identifiers: *Oil characterization, *Oil fingerprinting, Sample preparation, Petroleum products, Chemical recovery, Chemical composition, Precision, Fuel oil, Infrared scans, Lube oil, Vanadium, Atomic absorption, Crude oil, Diesel oil, Oil types, Organic solvents, Paper strip method, Bunker fuel oil, Medium oil, Light oil.

An approach used to trace an oil or a petroleum product found in or on water to a source is delineated. Sample preparation involves extracting a volume of the sample with a solvent, rinsing with distilled water to form an emulsion, and extracting with additional solvent. The solvent is filtered and removed completely by passing clean, dry nitrogen over the solvent-oil mixture in a hot water bath. The oil is then dessicated so that further analysis can proceed. The paper strip and gas chromatographic methods are used for comparing a source with a spill and the chromatographic fluorescence method is used for comparing samples of petroleum products. Infrared scans are used to compare oily water with potential sources. Sulfur and metallic techniques are used to determine sulfur and metal content. All the data collected are compared with data on crude and refined products and some judgment can be made as to whether the sample is a crude or refined product and on the locality of the original crude. The 'fingerprints' of the oil can then be compared with possible sources. (Holoman-Battelle)
W73-11024

MICROBIAL COMMUNITY STRUCTURE IN CONTAMINATED ESTUARIAN SEDIMENTS,
North Texas State Univ., Denton.
For primary bibliographic entry see Field 05C.
W73-11025

DIFFERENTIATION OF SOME ENTEROCOCCI BY GAS CHROMATOGRAPHY,
Iowa State Univ., Ames. Dept. of Bacteriology.
C. F. Amstein, and P. A. Hartman.
Journal of Bacteriology, Vol 113, No 1, p 38-41, January 1973. 1 fig, 2 tab, 21 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Streptococcus, *Separation techniques, Bioindicators, Enteric bacteria, Water pollution sources, Cultures.
Identifiers: *Fatty acids, Streptococcus faecalis, Streptococcus faecium Streptococcus faecium var. durans, Streptococcus faecium var. casseliflavus, Sample preparation, Culture media.

If enterococci are to be useful as indicators of fecal pollution in foods, it will be necessary to differentiate fecal and non-fecal types. A method was attempted which involved determining relative fatty acid compositions of 37 enterococci by gas chromatography. Streptococcus faecalis, Streptococcus faecium, and Streptococcus faecium var. casseliflavus, and a motile yellow-pigmented streptococcus, contained very low levels of C sub 19:0 cyclopropane fatty acid and four unidentified components, compared to the other strains of enterococci examined. The studies clarified the relationships between existing species and varieties, but showed no significant differences in the fatty acid patterns of enterococci grouped according to plant, animal, or human source. (Little-Battelle)
W73-11027

THE DETERMINATION OF TRACE METALS AND THEIR SIGNIFICANCE IN CLINICAL CHEMISTRY,
Hospital for Sick Children, London (England).
H. T. Delves.
Atomic Absorption Newsletter, Vol 12, No 2, p 50-54, March-April 1973. 4 fig, 3 tab, 26 ref.

Descriptors: *Copper, *Lead, *Zinc, Cadmium, Manganese, Cobalt, Iron, Nickel, Heavy metals, *Trace elements, *Metals.
Identifiers: *Blood, *Plasma, Sample preparation, *Atomic absorption spectrophotometry, Flame microsampling, Furnace atomization, Sensitivity, Precision, Delves cup method, Flameless atomic absorption spectrophotometry, Ashing.

Because of the relationship of both essential and non-essential trace metals to human health and environmental conditions, analysis of trace metals in tissue, blood, urine, and plasma is important. Work is reviewed in developing methods or analyzing lead in blood and urine, copper in plasma, and copper and zinc in plasma protein fractions. Difficulties with flame AA analysis of lead in blood and urine have been overcome by using flame-assisted microsampling techniques or furnace atomization techniques. Flame microsampling has also been used to determine copper in plasma. Furnace atomization has proven useful for determining less volatile metals and has been used to investigate copper and zinc concentrations in plasma fractions. The sensitivity and precision of this technique are given for Zn, Cd, Mn, Pb, Cu, Co, Fe, and Ni. (Little-Battelle)
W73-11030

TRACE ELEMENT DETERMINATION WITH SEMICONDUCTOR DETECTOR X-RAY SPECTROMETERS,
California Univ., Berkeley. Lawrence Berkeley Lab.
R. D. Giauque, F. S. Goulding, J. M. Jaklevic, and R. H. Pehl.
Analytical Chemistry, Vol 45, No 4, p 671-681, April 1973. 17 fig, 6 tab, 20 ref.

Descriptors: *X-ray spectroscopy, Air, *Aqueous solutions, Separation techniques, *Heavy metals, Rocks, Chromium, Manganese, Iron, Nickel, Copper, Zinc, Bromine, Strontium, Lead, Potassium, Calcium, Titanium, Absorption, Air pollution, Calibrations, Laboratory equipment, *Trace elements.
Identifiers: Blood, Sample preparation, Orchard leaves, *Semiconductor detector, Detection limits, Biological samples, Freeze drying, Arsenic, Rubidium, Vanadium, Gallium, Selenium, Tissue, Sensitivity.

A method of obtaining high sensitivity and accuracy in X-ray fluorescence analysis using semiconductor detector spectrometers is discussed. Monoenergetic exciting radiation is employed to generate characteristic X-rays from trace elements in thin, uniform specimens. Corrections for absorption effects are determined; enhancement effects are omitted as they are negligible for many thin specimens. A single element thin-film standard is used to calibrate for the X-ray geometry, and theoretical cross sections and fluorescent yield data are employed to relate the X-ray yields for a wide range of elements to the thin-film standard. Various corrections which affect the accuracy of the method are discussed including the method for determining X-ray spectral background. Samples of orchard leaves, tissue, blood, and other biological materials are prepared for analysis by freeze- or oven-drying, pulverizing, and pressing into pellets. Rock, glass, and pottery specimens are prepared by pulverizing, collecting on thin filters, and transferring the dust to Millipore filters. Elements in solution are absorbed on cellulose powder, dried, pulverized, and pressed into pellets. Elements in air can be analyzed directly from filter papers. Samples of orchard leaves, rocks, pottery, and air particulate filters were analyzed for metals including Cr, Mn, Fe, Ni, Cu, Zn, As, Br, Rb, Sr, Pb, K, Ca, Ti, V, Ga, and Se. Using a single excitation energy, the concentrations of more than fifteen trace elements may be simultaneously determined during a fifteen-minute interval for concentrations of 1 ppm or less. (Little-Battelle)
W73-11031

SEPARATION AND CHARACTERIZATION OF DIMETHYLNITROBIPHENYL AND DIMETHYLBIPHENYLAMINE ISOMERS BY CHROMATOGRAPHIC AND SPECTROMETRIC METHODS,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
P. A. Dudley, M. W. Noall, and D. M. Desiderio.
Analytical Chemistry, Vol 45, No 4, p 703-706, April 1973. 4 fig, 12 ref.

Descriptors: *Separation techniques, *Infrared radiation, *Ultraviolet radiation.
Identifiers: Characterization, *GC-mass spectrometry, *Sample preparation, *Isomers, Dimethylbiphenyls, Dimethylbiphenylamines, Infrared spectra, Ultraviolet spectra, Partitioning, Chromatograms, 2' 3-Dimethyl-4-nitrobiphenyl, 3 3'-Dimethyl-4-biphenylamine, 2' 3-Dimethyl-4-biphenylamine, 2' 3-Dimethylbiphenyl.

Diazotized 4-nitro-m-toluidine when coupled with toluene yields a mixture of dimethyl positional isomers of 2'-,3'-, or 4'-dimethyl-4-nitrobiphenyl. The 2',3-dimethyl-4-nitrobiphenyl isomer is of interest as a precursor for the carcinogen 2',3-dimethyl-4-diphenylamine and the related hyroxamic acid. The 2',3-dimethyl-4-nitro isomer is separated on a preparative scale from the 3,3'- and 3,4'-dimethyl isomers in a cyclohexane-heptane-nitromethane liquid-liquid partition chromatography system. The chromatographic system resolved 2',3-dimethyl-4-biphenylamine from the two corresponding dimethylamine isomers and from the nitro compounds. The 2',3-dimethylnitro or amine isomers may be analyzed by GLC on a 4-mm x 5-foot column of 2 percent OV-17 on Gas Chrom P. The methyl positional isomers of the nitro and amine compounds and their corresponding hydrocarbons have been characterized and compared to reference hydrocarbons by mass spectrometry. The 2',3-dimethyl nitro and amine compounds are additionally characterized by physical constants, IR, and UV spectral data. (Little-Battelle)
W73-11032

TRACE ELEMENT ANALYSIS IN WATER BY PROTON ACTIVATION,
California Univ., Davis. Dept. of Applied Science.
S. F. Bankert, S. D. Bloom, and G. D. Sauter.
Analytical Chemistry, Vol 45, No 4, p 692-697, April 1973. 9 fig, 3 tab, 6 ref.

Descriptors: *Water analysis, Nitrogen, Bromine, Boron, Cadmium, Chromium, Sodium, Evaporation, Calibrations, Instrumentation, Laboratory equipment, *Trace elements.
Identifiers: *Sample preparation, *Proton activation analysis, Selenium, Detection limits, Sensitivity.

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Charged particle activation analysis (CPAA) has been applied to the measurement of trace amounts of pollutants in calibrated water samples. The activating particles are 14.7 MeV protons in a microampere (or less) beam from the Lawrence Livermore Laboratory 30-inch cyclotron. The short half-live gamma spectrum of the activated sample is assayed in a Nal-Ge (Li) anticoincidence detector system. A fast transit system carries the sample from the bombardment site to the counting position in about 1.8 seconds. As of now, the technique is capable of simultaneously detecting ppm quantities of boron, nitrogen, bromine, selenium, sodium, cadmium, and chromium in concentrated water samples evaporated to dryness on tantalum foils. However, it is applicable to any thin sample which can be fixed to a foil. (Little-Battelle)
W73-11033

ON-THE-FLY GAS CHROMATOGRAPHY-INFRARED SPECTROMETRY USING A CHOLESTERIC LIQUID CRYSTAL-EFFLUENT INTERFACE,
Hunter Coll., New York. Dept. of Chemistry.
J. O. Lephardt, and B. J. Bulkin.
Analytical Chemistry, Vol 45, No 4, p 706-710, April 1973. 9 fig, 4 ref.

Descriptors: *Gas chromatography, *Organic compounds, Pollutant identification.
Identifiers: Toluene, Chloroform, 1 2-dichloroethane, Carbon tetrachloride, Nitrobenzene, m-Chloroaniline, o-Toluidine, p-Chloroaniline, N N-dimethylaniline, *GC-Infrared spectrometry, Infrared spectra, Cholesteric liquid crystals, On-the-fly gas chromatography.

A GCIR system is described which combines the features of trapping and on-the-fly techniques. The heart of the system is a cholesteric liquid crystal film. The system was used to obtain infrared spectra of toluene, chloroform, 1,2-dichloroethane, carbon tetrachloride, nitrobenzene, m-chloroaniline, o-toluidine, o-chloroaniline, and n,n-dimethylaniline. On-the-fly IR specrra of organic vapors can be obtained with quantities as small as 50 micrograms. The liquid crystal fractionates sample from carrier gas. The technique yields spectra which are solution rather than gas phase spectra, eliminating problems of rotational structure and vapor-liquid frequency shifts. The system can also be used for on-the-fly spectra of organic vapors in an air stream, with comparable efficiency. Color shifts occurring on adsorption and desorption of the effluents onto the liquid crystal film can be monitored to trigger infrared scanning and eliminate delay time errors associated with gas cell operation. The range of the system can be extended by changing the carrier gas to effluent ratio for high boiling materials. (Little-Battelle)
W73-11034

GAS CHROMATOGRAPHIC SEPARATION, BY CARBON NUMBER AND HYDROCARBON TYPE, OF SATURATED HYDROCARBON MIXTURES AND DIFFERENT NAPHTHAS OVER MOLECULAR SIEVES 13X,
Settore Laboratori Chimici, Syracuse (Italy).
F. Garilli, L. Fabiani, U. Filia, and V. Cusi.
Journal of Chromatography, Vol 77, No 1, p 3-10, March 14, 1973. 3 fig, 8 tab, 2 ref.

Descriptors: Methodology, *Separation techniques, *Molecular structure, Chemical analysis, Pollutant identification, *Gas chromatography.
Identifiers: *Flame ionization gas chromatography, *Gas solid chromatography, *Naphtha, Mixtures, *Aliphatic hydrocarbons, Oil types, Aromatic hydrocarbons, Molecular sieves, Crude oil, n-Paraffins, Naphthenes, iso-Paraffins, n-Butane, n-Pentane, Propane, n-Hexane, n-Heptane, n-Octane, n-Nonane, Toluene, Xylene, n-Decane, Cyclohexane, 2 3-Dimethylbutane, Methylcyclohexane, 3-Methylhexane, 2-Dimethylcyclohexane, 3-Methylheptane, 1 3 5-Trimethylcyclohexane, 4-Methyloctane.

A gas-solid chromatographic method is described for separating hydrocarbon mixtures according to hydrocarbon type and carbon number by the use of molecular sieves 13X. Practical applications of this analytical method are reported, including the analysis of the charge and the end-products of a platforming plant, and in addition, some quantitative and qualitative determinations on virgin naphtha from different types of crude oil. (Holoman-Battelle)
W73-11035

THE USE OF GAS-LIQUID CHROMATOGRAPHY FOR SELECTING EXTRACTIVE SOLVENTS FOR LIQUID EXTRACTION PROCESSES,
Z. I. Abramovich, M. F. Bondarenko, E. A. Kruglov, R. M. Masagutov, and M. A. Pais.
Journal of Chromatography, Vol 77, No 1, p 37-40, March 14, 1973. 1 tab, 10 ref.

Descriptors: *Solvent extractions, *Selectivity, *Separation techniques, Phenols, Alcohols, Nitrogen compounds, Sulfur compounds, Organic compounds.
Identifiers: *Gas liquid chromatography, *Organic solvents, Esters, Aromatic hydrocarbons, Thiophane, o-Cresol, Diisopropyl sulfide, n-Octane, 2-Methyl thiophene, Toluene, Kerosene, Gas oil, m-Cresol, p-Cresol, o-Chlorophenol, Ethylene glycol, Triethylene glycol, Benzyl alcohol, Furfuryl alcohol, Propylene carbonate, Dimethyl malonate, Diethyl oxalate, Diisopropyl malonate, Formamide, Ethyl carbamate, Aniline, Dimethylaniline, Nitrobenzene, Benzonitrile, 1-Nitro-2-methylpropanol-2, N-Methylpyrrolidone, Dimethyl sulfoxide, Sulpholane, Acetylthiophene, Furfural, Maleic anhydride, n-Tetradecane, alpha-Methylnaphthalene.

Gas-liquid chromatography has been used to investigate the group selectivity of 28 solvents in the separation of cyclic and aliphatic sulfides from the hydrocarbons. The solvents containing -OH and -NH2 groups were the most selective in separating the cyclic sulfides and monocyclic aromatic hydrocarbons. The data obtained allowed an extractive solvent (phenol) to be chosen for separating the cyclic sulfides from the kerosene-gas-oil fractions. With the straignt-run petroleum fraction 275-350 degrees the possibility of obtaining the sulfide concentrates with the help of liquid extraction was experimentally confirmed. (Holoman-Battelle)
W73-11036

COMPARISON OF FLAME AND FLAMELESS ATOMIC ABSORPTION FOR THE DETERMINATION OF CALCIUM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02K.
W73-11037

SOME OBSERVATIONS ON STANDARD MERCURY SOLUTIONS FOR ATOMIC ASBORPTION SPECTROSCOPY,
Tohoku Univ., Sendai (Japan). Dept. of Applied Chemistry.
T. Odashima, and Y. Kumagai.
Atomic Absorption Newsletter, Vol 12, No 2, p 39, March-April 1973. 2 fig, 2 ref.

Descriptors: *Mercury, Heavy metals, Absorption, Pollutant identification.
Identifiers: *Atomic absorption spectrophotometry, *Standard solutions, *Mercury nitrate, *Mercury chloride, Chemical interference.

Measurements made with a Hitachi Model 207 atomic absorption spectrometer showed that the atomic absorption of mercury at 254 nm in air-acetylene flames is greatly influenced by certain types of standard mercury (II) solutions. When mercury (II) chloride was used for standard solutions, rectangular absorption peaks were obtained, but when mercury (II) nitrate was used, there was tailing of the peaks. The tailing effect can be eliminated by adding sufficient quantities of halides such as KCl, KBr, KSCN, or KI. (Little-Battelle)
W73-11038

THE APPLICATION OF FLAMELESS ATOMIC ABSORPTION IN HYDROGENOCHEMICAL ANALYSIS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 02K.
W73-11039

SELECTIVE DETERMINATION OF HETERO--ORGANICS BY A DUAL-CHANNEL DETECTOR BASED ON FLAME CONDUCTIVITY AND EMISSION,
Missouri Univ., Columbia. Dept. of Agricultural Chemistry.
W. A. Aue, and H. H. Hill, Jr.
Analytical Chemistry, Vol 45, No 4, p 729-732, April 1973. 2 fig, 1 tab, 5 ref.

Descriptors: Iron, Lead, Tin, *Phosphorus, *Sulfur, *Carbon, *Gas chromatography, Laboratory equipment, *Metals.
Identifiers: *Flame ionization detector, Detection limits, Dodecane, Trimethylphosphate, Di-n-butyl-disulfide, Tetraethyl lead, Tetraethyl tin, Ferrocene, Biological samples, Environmental samples.

A simple dual-channel detector was constructed from a regular FID and a spectrometer and used to study ionization and emission processes occurring in hydrogen flames. The response of the system was tested with dodecane, trimethyl-phosphate, di-n-butyl-disulfide, tetraethyl lead, tetraethyl tin and ferrocene under air-rich and hydrogen-rich conditions. The results showed that both emission and ionization responses can be used to determine the metals in the nanogram and picogram ranges, respectively; while the response to carbon is repressed by several orders of magnitude. The method should prove useful for biological and environmental samples. (Little-Battelle)
W73-11040

A NEW MODEL FOR THE RESPONSE OF A CYANIDE SELECTIVE SILVER IODIDE MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
G. P. Bound, B. Fleet, H. von Storp, and D. H. Evans.
Analytical Chemistry, Vol 45, No 4, p 788-789, April 1973. 2 fig, 1 tab, 10 ref.

Descriptors: Electrodes.
Identifiers: *Ion selective electrodes, *Cyanides, *Selectivity, Membrane electrodes.

Selectivity data are presented for a pure AgI membrane in a mercury-mercuric chloride test cell. K values were calculated from results obtained with individual solutions and with solutions containing a constant level of iodide to which varying concentrations of cyanide were added. A model describes the behavior of the electrodes and accounts for the differences in K values obtained with the two solutions. (Little-Battelle)
W73-11041

A PENICILLIN SELECTIVE ENZYME ELECTRODE,
Wyeth Labs., Inc., Philadelphia, Pa. Analytical and Physical Chemistry Section.
G. J. Papariello, A. K. Mukherji, and C. M. Shearer.
Analytical Chemistry, Vol 45, No 4, p 790-792, April 1973. 2 fig, 2 tab, 13 ref.

Descriptors: *Fabrication, Physical properties, *Aqueous solutions, *Selectivity, *Electrodes, Research equipment, Pollutant identification, Antibiotics (Pesticides), Chemical reactions, Methodology, Laboratory equipment, Bactericides, Hydrogen ion concentration, Enzymes, Temperature.
Identifiers: *Penicillinase, Enzyme electrodes, Penicillin, *Penicillin enzyme electrode, Membrane electrodes, Substrate concentration, Detection limits, Response time, Specificity, Sodium ampicillin, Sodium nafcillin monohydrate, Potassium penicillin G, Potassium penicillin V, Potassium cyclicillin, Sodium dicloxacillin monohydrate, Drugs, Penicilloic acid, Ion selective electrodes.

An enzyme electrode has been developed which utilizes penicillin beta-lactamase (penicillinase) and is responsive to intact penicillin. The electrode is prepared by immobilizing the penicillinase in a thin membrane of polyactylamide gel molded around and in intimate contact with a hydrogen ion glass electrode. When this electrode is exposed to an aqueous solution of penicillin adjusted to a pH of 6.4, and immobilized enzyme hydrolyzes the penicillin to produce the corresponding penicilloic acid. The increase in hydrogen ion concentration from the penicilloic acid is sensed by the glass electrode and a potentiometric response is recorded. This electrode is analytically useful in the penicillin concentration range of 0.0001-0.05 M. The response time is dependent upon the age of the electrode, with the typical response time being 15-30 sec. pH affects the solubility and stability of penicillin, and the reactivity of penicillinase. The electrode was most sensitive and responsive at pH 6-7. If the electrode is prepared as recommended, (1) there is enough penicillinase to react with more than 0.5 mole of a penicillin; and (2) the electrode will function in an acceptable manner for up to 2 weeks making possible a hundred or more measurements. (Holoman-Battelle)
W73-11042

X-RAY MICRODETERMINATION OF CHROMIUM, COBALT, COPPER, MERCURY, NICKEL, AND ZINC IN WATER USING ELECTROCHEMICAL PRECONCENTRATON,
Seton Hall Univ., South Orange, N.J. Dept. of Chemistry.
B. H. Vassos, R. F. Hirsch, and H. Letterman.
Analytical Chemistry, Vol 45, No 4, p 792-794, April 1973. 2 fig, 1 tab, 11 ref.

Descriptors: *X-ray fluorescence, *Aqueous solutions, *Water analysis, Copper, Mercury, Zinc, Nickel, Cobalt, Chromium, Separation techniques, *Heavy metals, Electrodes.
Identifiers: *Electrodeposition, *Sensitivity, *Metal ions, Preconcentration, Sample preparation, Detection limits, Chemical interference, Errors, Precision, Pyrolytic graphite electrodes.

The sensitivity of x-ray fluorescence for the analysis of metal ions in aqueous solutions can be improved by preconcentration of the solution. A preconcentration procedure has been developed which consists of electrodeposition of the metals to be determined onto a pyrolytic graphite electrode. This separates the reducible metal ions from the dilute solution into a form particularly suitable for analysis by x-ray fluorescence. After deposition, a thin dish is cleaved from the electrode surface and analyzed. The method has been evaluated by analysis of Cu, Hg, Zn, Ni, Co, and Cr in solutions of low electrolyte concentration (approximately fresh water) and with conventional levels of supporting electrolyte. By the criterion of 'total error', all the results fall into the 'excellent' category except for the Cr results which are 'acceptable'. It is concluded that the method is useful for ppm determinations of the metals studied, is amenable to improved sensitivity, and can be modified for analysis of additional metal ions. (Little-Battelle)
W73-11043

IDENTIFICATION OF HEAVIER AROMATIC COMPONENTS IN REFORMED PETROLEUM PRODUCTS BY DIRECT COUPLED CAPILLARY GAS CHROMATOGRAPHY-MASS SPECTROMETRY,
Gulf Research and Development Co., Pittsburgh, Pa. Pennsylvania.
J. T. Swansiger, and F. E. Dickson.
Analytical Chemistry, Vol 45, No 4, p 811-813, April 1973. 2 fig, 2 tab, 13 ref.

Descriptors: Organic compounds, *Mass spectrometry, *Gas chromatography, *Aromatic compounds.
Identifiers: *Reformates, *GC-mass spectrometry, Boiling point, Gasoline, Kerosene, *Oil characterization, Chromatograms, Petroleum products, Benzene, Methyl diethyl benzene, Naphthalene.

The objective was to identify as many components in the C10 and heavier range of reformed petroleum products and to utilize to the fullest extent possible the capabilities of the mass spectrometric interface in identifying the capillary GC peaks. It was possible to isolate the C10-C11 fractions from a typical reformate and the C11-C14 fraction from an alkylated reformate. The major peaks appearing in the capillary GC of the C10-C11 cut (21 peaks) were identifiedand 95 percent (13 peaks) in the C11-C14 fraction were identified. The C10-C11 fraction was isolated by preparative gas chromatography using a 5-1/2 ft column packed with OV-1 on Chromosorb P. This fraction was injected into a 200 ft column with (m-phenoxy, phenoxy) benzene/squalane and programmed from 50 to 90C at 1C per minute. The C11-C14 fraction was isolated by distillation of components boiling above 187 C. The distillate was injected in a 150-ft column coated with polyphenyl ether and programmed from 50 to 160 C at 5 C per minute. Mass spectra were obtained at 70 eV with an ionizing current of 150 micro amps. The GC peaks were scanned at 2 sec per decade for the C10-C11 fraction and 4 sec per decade for the C11-C14 decade. The chromatograms, formulas, compound names, and boiling points of the fractions are listed. (Little-Battelle)
W73-11044

SPECTROPHOTOMETRIC DETERMINATION OF SULFATE ION WITH BARIUM IODATE AND THE LINEAR STARCH IODINE SYSTEM,
Sam Houston State Univ., Huntsville, Tex. Dept. of Chemistry.
W. L. Hinze, and R. E. Humphrey.
Analytical Chemistry, Vol 45, No 4, p 814-815, April 1973. 2 tab, 12 ref.

Descriptors: *Aqueous solutions, *Sulfates, *Spectrophotometry, Ions, *Ion exchange, Bicarbonates, Sulfites, Bromides, Chlorides, Nitrates, Alkalis (Bases), Absorbance.
Identifiers: *Sample preparation, *Detection limits, Chemical interference, Recovery, Borates.

A spectrophotometric method has been developed for the determination of sulfate ions in the low ppm range which involves an ion-exchange reaction with a slightly soluble sulfate and release of an absorbing anion into the solution. Barium iodate and linear starch iodide were used in solutions of sodium sulfate. Two dilution procedures were used to cover larger ranges of concentrations. Sulfate ions were measured over the range of 1-4 ppm with a lower dilution, and the effective molar absorptivity for sulfate was 31,000. With a higher dilution, the range was 4-14 ppm and the molar absorptivity was 9400. Color reactions were stable and the results were reasonably reproducible. A very limited study of interferences showed that bicarbonate, borate, hydroxide, and sulfite ions could not be tolerated while bromide, chloride, and nitrate ions had no effect. Results with barium iodate compare favorably with those from the chloroanilate method. (Little-Battelle)
W73-11045

METHOD FOR EXPOSING BACTERIAL CULTURES ON SOLID MEDIA TO A DEFINED GAS MIXTURE USING NYLON BAGS,
Agricultural Research Council, Brighton (England). Unit of Nitrogen Fixation.
S. Hill.
Laboratory Practice, Vol 22, No 3, p 193, March 1973. 1 fig, 4 ref.

Descriptors: *Cultures, *Bacteria, Methodology, *Gases, *Anaerobic bacteria, Oxygen, Nitrogen, Laboratory equipment.
Identifiers: *Mixtures, Derxia gummosa, Clostridium pasteurianum, Desulfovibrio desulfuricans, Nylon bags, Growth media, Culture media.

In order to avoid any alteration of bacterial growth, a method has been devised for using nylon bags in the exposure of bacterial cultures on solid media to a defined gas mixture. The bags ensure a constant gas composition throughout the incubation period. Large numbers of cultures can easily be handled and growth can be observed without exposing the cultures to air. A description is given of the apparatus which has been used successfully for investigating the effect of 02 concentration on colony formation of Derxia gummosa grown on solid N-free media (Hill, 1971). The obligate anaerobes Clostridium pasteurianum and Desulfovibrio desulfuricans have been grown on solid media in nylon bags: Clostridium pasteurianum on thioglycollate medium (Oxoid Ltd, England) under N2 plus 1 percent CO2 and Desulfovibrio desulfuricans on Baars's medium (Pankhurst, 1966) under N2. (Holoman-Battelle)
W73-11049

THE EXTRACTION OF DIVALENT COBALT, COPPER, ZINC AND CADMIUM FROM HYDROCHLORIC ACID SOLUTIONS BY TRI--N-BUTYL PHOSPHATE,
Shizuoka Univ., Hamamatsu (Japan). Dept. of Applied Chemistry.
T. Sato.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 12, p 1233-1242, December 1972. 4 fig, 4 tab, 24 ref.

Descriptors: *Cations, *Cobalt, *Copper, *Zinc, *Cadmium, *Solvent extractions, *Aqueous solutions, Heavy metals, Separation techniques, Efficiencies, Phosphates, Acids.
Identifiers: Tri-n-butyl phosphate, Organic solvents, Chemical indicators, EDTA, Xylenol orange, Infrared spectra, Absorption spectra, Hydrochloric acid, Benzene, Kerosene.

The partition of divalent cobalt, copper, zinc, and cadmium between hydrochloric acid solutions and solutions of tri-n-butyl phosphate (TBP) in benzene or kerosene has been investigated under different conditions. Further the absorption spectra of both the aqueous and organic phases have been studied, and the infrared spectra or the organic phases have been examined. The order of the extraction efficiency of TBP for divalent metals is Zn greater than Cd greater than Cu greater than Co for aqueous HC1 less than 8 M and Zn greater than Cd greater than Co greater than Cu for aqueous HC1 greater than 8 M. (Holoman-Battelle)
W73-11050

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5B. Sources of Pollution

MICROBIAL CHANGES AND POSSIBLE GROUND WATER POLLUTION FROM POULTRY MANURE AND BEEF CATTLE FEEDLOTS IN GEORGIA,
Georgia Univ., Athens. Dept. of Agronomy.
J. Giddens, A. M. Rao, and H. W. Fordham.
Available from the National Technical Information Service as PB-220 956, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta Report ERC-0573, May 1973, 57 p, 14 fig, 16 tab, 6 ref. OWRR A-031-GA (1). 14-31-0001-3210.

Descriptors: *Farm wastes, Confinement pens, *Feed lots, *Fertilizers, Soil microbiology, *Nitrates, *Poultry, *Coliforms, Water pollution sources, *Georgia, *Microbial degradation, Path of pollutants.

Laboratory and field studies were used to determine the effect of methods of application and handling poultry manure upon nitrate and other nutrients in the soil and upon microbial changes during decomposition. Among the findings: one-half the nitrogen in poultry manure volatilizes upon air-drying. Repeated light applications of manure produce less soil nitrate (ground water pollution) than fewer heavy applications totaling the same amount, and applications on the soil surface produce less nitrate than do those incorporated into the soil. Coliform bacteria decrease rapidly when manure is worked into the soil or exposed to the ammonia produced in the manure. Soil fungi decrease during early manure decomposition stages. Coliforms reach high levels in nearby ponds after rainfall periods. Soil surveys at 21 beef cattle feedlots also indicate that contamination from surface runoff is a much greater pollution hazard than ground water contamination. Ground water contamination is minimized by allowing the manure to volatilize at the soil surface. (James-Geo Tech)
W73-10403

THE ORIGIN, EFFECTS AND CONTROL OF TURBIDITY IN AN URBAN RECREATIONAL LAKE,
Massachusetts Univ., Amherst. Water Resources Research Center.
C. Carranza, and S. M. Bemben.
Available from the National Technical Information Service as PB-220 963, $5.45 in paper copy, $0.95 in microfiche. Completion Report FY73-5, February 1973. 106 p, 17 fig, 3 tab, 8 photo, 60 ref. OWRR A-037-MASS (1).

Descriptors: *Urbanization, *Turbidity, Recreation wastes, Pollution, *Massachusetts, Storm water, Color, Suspended solids, Suspended load, Dissolved solids, Ions, Bottom sediments, Water pollution sources.
Identifiers: *Chicopee (Mass), Lake Pollution, Storm water pollution, Street pollution, *Mountain Lake (Mass), Dissolved ions.

'State of the art' is described of the water quality parameter known as turbidity, particularly with regard to the effects of urbanization on a recreational water body. Field and laboratory data are presented which support a new broader definition for the parameter. For the general case, it is shown that turbidity is a composite parameter which is well related to apparent color, suspended solids concentrations, dissolved ion concentrations and the optical properties of suspended solids. The traditional relationships to B.O.D., D.O., CO2, total hardness, alkalinity, and pH are not challenged but rather are augmented. For the specific field case considered, it is shown that the degree of turbidity is related to the character and degree of urbanization, the natural geologic setting and the weather conditions.
W73-10406

INFLUENCE OF NA3NTA AND NA4 EDTA UPON THE ACTIVATION OF METALS IN RIVER AND LAKE SEDIMENTS IN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
B. D. Knezek, L. M. Mugwira, and B. G. Ellis.
Available from the National Technical Information Service as PB-220 950, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, Michigan Institute of Water Research, May 1973, 26 p, 4 fig, 13 tab. OWRR A-043-MICH (1). 14-31-0001-3222.

Descriptors: *Chelation, *Phosphorus, Detergents, *Michigan, Lakes, Lake sediments, *Nitrilotriacetic acid, Rivers, *Metals, *Bottom sediments.
Identifiers: Red Cedar River (Mich), Grand River (Mich), *EDTA, Chelating agents.

Bottom sediments were collected from the Red Cedar River, above and below the watewater discharge of a metal workings plant, from the Grand River, above and below the sewage disposal discharge of the City of Grand Rapids, Michigan, and from six lakes for metal activation studies. These sediments were equilibrated with O, 10 to the minus 6th power, 10 to the minus 5th power and 10 to the minus 4 power, M Na3NTA and Na4EDTA for 1, 3, 6, 9 and 14 days and Grand Rapids sewage sludge was equilibrated with these solutions for one day to determine the amount of metals solubilized. Trisodium NTA and Na4EDTA at concentrations of 10 to the minus 5th power M and 10 to the minus 4th power M solubilized significant amounts of Ni and Zn, but only from sediments contaminated with high amounts of these metals. The percentages of the metals extracted indicated that Na3NTA was most effective in solubilizing Ni and Na4EDTA was most effective in solubilizing Zn. With sediments low in total Ni and Zn both chelates tended to solubilize more Fe and Cu. The amounts of Fe and Cu extracted, however, were minute when compared to Ni and Zn solubilized. In general Na3NTA and Na4EDTA did not influence the removal of Ca, Mg, Mn, or Cr from the river or lake bottom sediments even though total metal contents of these elements were often high. The amount of metal solubilization from sediments due to chelation with Na3NTA was not great enough to be a probable environmental threat under the conditions investigated.
W73-10408

INFLUENCE OF VEGETATION AND SUBSTRATE ON STREAMWATER CHEMISTRY IN NORTHERN UTAH,
Utah Center for Water Resources Research, Logan.
G. E. Hart, A. R. Southard, and J. S. Williams.
Available from the National Technical Information Service as PB-220 954, $3.00 in paper copy, $0.95 in microfiche. Completion Report April 1973. 53 p, 9 fig, 20 tab, 8 ref. OWRR A-007-UTAH (2). 14-31-0001-3545.

Descriptors: *Chemistry of precipitation, *Throughfall, Trees, Water chemistry, Nutrients, *Utah, *Douglas fir trees, *Juniper trees, Geology, *Nutrient analysis, Drainage.
Identifiers: Nutrient budget.

Chemical composition of precipitation, of throughfall under Douglas fir and under juniper trees, and of streamwater from two mountain-brush drainages in northern Utah were monitored for two years, Elements examined were sodium, calcium, magnesium, potassium, phosphorus, nitrate nitrogen, conductive, and acidity. Precipitation chemistry was somewhat greater than values reported for other regions and displayed an increase in concentrations in spring and summer. This increase is attributed to dry fallout of dust produced by agricultural activities or from dry salt flats upwind of the area. Concentration of cations were from 3 to 16 times greater under trees than in open precipitation. Large percentage increases were observed in throughfall for phosphorus and nitrate nitrogen, although absolute values reamined rather low (about 4 ppm and 5 ppm, respectively). Douglas-fir consistently yielded higher concentrations in throughfall than did juniper, due probably to differences in canopy area and growth form. Analyses of streamwater showed concentrations of sodium and magnesium that were about in proportion to the percentage of calcareous bedrock (limestone or dolomite) in the two drainages. Nutrient budgets for this locality show a net loss of 40 to 100 lbs/acre/yr of calcium and 20 to 40 lbs/acre/yr of magnesium. Inputs and outputs of sodium and potassium were about in balance while the input of nitrates was three times greater than output.
W73-10413

DEEP WATER RENEWAL IN SAANICH INLET, AN INTERMITTENTLY ANOXIC BASIN,
Washington Univ., Seattle. Dept. of Oceanography,
J. J. Anderson, and A. H. Devol.
Estuarine and Coastal Marine Science, Vol 1, No 1, p 1-10, January 1973. 6 fig, 1 tab, 10 ref. NSF Grant GA-10084.

Descriptors: *Water circulation, *Density stratification, *Fjords, *Water chemistry, Dissolved oxygen, Sulfates, Sulfides, Nitrates, Density currents.
Identifiers: *Saanich Inlet (B C).

Saanich Inlet is a fjord on the southeast side of Vancouver Island. Its shallow sill is approximately 70 m deep and its inside depth averages 236 m. Its bathymetry and a strong vertical pycnocline isolate the deep water, resulting in drastic changes in the chemical composition. The changes are initiated by biochemical processes reducing the oxygen concentration of the isolated deep water to a level where aerobic respiration is no longer favored. Organic matter is then oxidized by nitrate-reducing bacteria. Finally, when the nitrate concentration of the deep water reaches zero, or nearly so, sulfate reduction begins; sulfate becomes the terminal electron acceptor for the oxidation of organic matter and hydrogen sulfide is produced. Because of these processes, the deep waters of the fjord are frequently devoid of oxygen and nitrate and contain significant amounts of hydrogen sulfide in the spring and summer. In late summer or early fall, dense, oxygenated water reaches the sill of Saanich Inlet from Haro Strait and flows down into the basin, displacing the resident deep water. Renewals equivalent to 64% and 33% of the deepwater volume, calculated from nitrate budgets, occurred in 1962 and in 1969. The time for 37% renewal of the deep water was estimated to be about 12 days. (Knapp-USGS)
W73-10432

MATHEMATICAL SIMULATION OF TIDAL TIME-AVERAGES OF SALINITY AND VELOCITY PROFILES IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 02L.
W73-10436

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
W. Egan.
Available from NTIS, Springfield, Va. 22151. AD-754 009. Price $3.00 printed copy; $0.95 microfiche. Research Department Memorandum RM-561J, December 1972. 24 p, 13 fig, 7 tab, 9 ref.

Descriptors: *Water quality, *Remote sensing, *Aerial photography, *Virgin Islands, Water pollution sources, Sedimentation, Waste disposal, Thermal pollution, Analytical techniques, Aircraft.

Identifiers: *Charlotte Amalie Harbor (V I), *St. Thomas (V I), Aircraft imagery, Color photography, ERTS-A.

The harbor at Charlotte Amalie on St Thomas, Virgin Islands, has a concentration of many factors affecting water quality: untreated sewage effluent, sediment from navigation and dredging operations, runoff from a garbage dump, and hot effluent from a desalination/power plant. Imagery from ERTS-A in association with aircraft imagery and ground truthing permits the characterization of water quality in terms of absolute color values. This necessitates the establishment of photometric standards resolvable by the ERTS-A sensors in order that atmospheric effects, which generally vary on sequential overpasses, may be determined and subtracted. The overall program is described together with typical numerical results. (Woodard-USGS)
W73-10437

TRACER SIMULATION STUDY OF POTENTIAL SOLUTE MOVEMENT IN PORT ROYAL SOUND, SOUTH CAROLINA,
Geological Survey, Washington, D.C.
F. A. Kilpatrick, and T. R. Cummings.
For sale by GPO, Washington, D.C. 20402 Price $0.55. Geological Survey Water-Supply Paper 1586-J, 1972. 27 p, 18 fig, 1 tab, 9 ref.

Descriptors: *Tracers, *Path of pollutants, *Dye releases, *Sounds, *South Carolina, Estuaries, Bays, Fluorescent dye, Sampling.
Identifiers: *Port Royal Sound (SC).

A tracer study was conducted in Port Royal Sound, South Carolina, to simulate the movement and ultimate pattern of concentration of a solute continuously injected into the flow. A total of 750 pounds of Rhodamine WT dye was injected by boat during a period of 24.8 hours in a line across the Colleton River. During the following 43 days, samples of water were taken in the sound, and the concentration of dye in the samples was determined by fluorometric analysis. The data obtained in the field study were used with theoretical models to compute the ultimate pattern of concentration of nonconservative and conservative solutes for a hypothetical continuous injection at the site on the Colleton River. (Knapp-USGS)
W73-10446

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W73-10459

ANALYSES OF DREDGED WASTES, FLY ASH, AND WASTE CHEMICALS - NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05A.
W73-10462

SALMONELLAE AND EDWARDSIELLA TARDA IN GULL FECES: A SOURCE OF CONTAMINATION IN FISH PROCESSING PLANTS,
Oregon State Univ., Corvallis. Dept. of Microbiology.
R. W. Berg, and A. W. Anderson.
Applied Microbiology, Vol. 24, No. 3, p 501-503, September 1972. 1 tab, 12 ref.

Descriptors: *Salmonella, Aerobic bacteria, Water pollution sources, *Gulls, Path of pollutants, Fish, Fish handling facilities, Water birds, Oregon, Food processing industries.
Identifiers: *Edwardsiella tarda, *Food contamination, *Fish processing plants, Feces, *Fecal pollution, Salmonella typhimurium, Salmonella reading, Salmonella enteritidis, Larus, Selective media, Enrichment.

The incidence of Salmonella and Edwardsiella tarda in gull feces on the Oregon Coast was studied to determine the role these birds may have in the contamination of fish products with these organisms. Approxiamtely 2.1 and 0.4 percent of 521 fecal specimens examined were found to contain Salmonella or E. tarda, respectively. (Holoman-Battelle)
W73-10463

THE APPLICATION OF MULTI-ATTRIBUTE SCALING PROCEDURES TO THE DEVELOPMENT OF INDICES OF VALUE,
Michigan Univ., Ann Arbor. Engineering Psychology Lab.
For primary bibliographic entry see Field 05A.
W73-10464

MARINA DEL REY: A STUDY OF ENVIRONMENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER,
University of Southern California, Los Angeles. Environmental Engineering Program.
F. R. Bowerman, and K. Y. Chen.
Available from the National Technical Information Service as COM-72-11123, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Publication No. USC-SG-4-71, December 1971. 59 p, 14 fig, 13 ref.

Descriptors: Water quality, Water pollution sources, Storm water, *Heavy metals, *Sediments, *Chlorinated hydrocarbon pesticides, *Sea water, Water analysis, Storm runoff, Lead, Cadmium, Mercury, Manganese, Iron, Dissolved oxygen, Hydrogen ion concentration, Gas chromatography, Sampling, Turbidity, Salinity, Benthos, Water temperature, Hydrogen sulfide, Organic matter, Detritus, Colorimetry, Alkalinity, Carbon, 2 4-D, 2 4 5-T, Endrin, Heptachlor, DDE, DDT, Aldrin, Coasts, *California.
Identifiers: Sample preparation, Preconcentration, *Atomic absorption spectrophotometry, *Electron capture gas chromatography, Species diversity, *Marina del Rey (Calif), Antimony, Settleable solids, Secchi disks, Total solids, Parathion, PCNB, Telodran, Dyrene, Heptachlor epoxide, Lindane, Neburon, Hexachlor benzene, Methyl ester 2 4-D, Ethyl hexyl ester 2 4-D, BHC, Chlordane, Toxaphene, o p' DDT, Dichlone, Diuron, p p' DDE.

The Marina del Rey boat harbor of southern California was studied to determine the current environmental conditions of the marina and the potential sources of contamination form the surrounding environment. Storm water and water from the marina were analyzed for clarity by Secchi disk, for temperature using a portable DO-temperature meter, for salinity using a conductivity meter, for turbidity by the Jackson Candle Method, and for hydrogen sulfide by colorimetry. Storm water and water and sediments from the marina were also analyzed for chlorinated hydrocarbons by electron capture GC and for metals (Cd, Pb, Hg, Mn, Fe, Sb) by AA. The extraction and preconcentration techniques are described. The following general conclusions were drawn: (1) The measurements of the dissolved oxygen, pH, alkalinity, turbidity and salinity show that the environmental variables of the Marina are within satisfactory levels. (2) The biological indices such as diversity and density of benthic life are very low in the Marina. (3) The quality of storm water is considered to be relatively harmless to the water quality of the Marina. (4) Chlorinated hydrocarbons are largely absent in storm water and in water samples of the Marina. However, in some locations of sediment, significant amounts of chlorinated pesticides have been detected. (5) Higher than normal concentrations of lead in both the Marina and storm water samples probably stem from automobile and marine exhausts. (6) Concentrations of heavy metals such as mercury and cadmium are generally low in water samples. However, significant accumulations in sediment have been detected. (7) Accumulation of sediment from storm waters is significant. (8) Debris from Ballona Creek in the breakwater region appear to affect the bottom conditions of the Marina. (Little-Battelle)
W73-10465

MULTI-SENSOR DETECTION AND TRACKING OF CONTROLLED OIL SPILLS,
Spectran, Inc., Hollywood, Calif. Microwave Sensor Systems Div.
J. C. Aukland, J. D. Sohn, and L. E. Rasmussen.
Available from the National Technical Information Service as AD-741 953, $3.00 in paper copy, $0.95 in microfiche. Final Report, May 1971. 138 p, 62 fig, 9 tab. Contract No. DOT-CG-11996-A.

Descriptors: *Oil spills, *Remote sensing, *Aerial photography, *Infrared radiation, *Ultraviolet radiation, Pollutant identification, Oil, Analytical techniques, Oil pollution, Equipment, Data processing, Ocean waves, *California.
Identifiers: *Microwave radiometers, Crude oil, No. 2 fuel oil, No. 6 fuel oil, Infrared scanners, Cameras, Sensors, Fuel oil, Radiometry, Radiometers, Multispectral sensing system.

Airborne remote sensing of controlled oil spills was carried out off the Coast of California during December 1970 and January 1971. The pollutants investigated were number 2 fuel oil, number 6 fuel oil, light crude oil, and heavy crude oil. All spills were made at a ships speed of 15 knots with spill rates of 0.5, 1.0, 2.5, and 5.0 GPM. All spills were made in at least three separate sea states, ranging from flat, zero sea-states to sea-states of 3 or greater with high wind velocities. The sensors used included two dual polarized microwave radiometers operating at 10.2 GHz and 30 GHz, an infrared scanner operating in the 8-14 micron region, and a 4-lens camera employing filters in the visible and the ultraviolet wavelengths. The purpose was to obtain information on detecting oil on the sea's surface and to compare this with other data. From this information recommendations were made for equipments and design parameters for an all-weather system. On the basis of this experiment and previous experiments on controlled oil spills, it is recommended that the primary sensing device be an 8-14 micron infrared scanner backed-up by a 35 GHz scanning microwave radiometer to provide all-weather capabilities. Documentation to analyze the quantity and types of oil spilled should be taken by a dual camera system operating in the .36-.4 micron region and the .6-.7 micron region. A control station is required in which the operator can view the scene prior to photographing and to record that information on video tape as well as photographic film. All of the proposed sensors are presently available and may be integrated into an all-weather pollution surveillance system without further development. Additional photographic data should be gathered on various controlled and accidental spills to increase the experience factor in oil rate identification. (Little-Battelle)
W73-10467

PERSISTENCE OF PARATHION IN SIX CALIFORNIA SOILS UNDER LABORATORY CONDITIONS,
California University, Riverside, Citrus Research Center and Agricultural Experiment Station.
Y. Iwata, W. E. Westlake, and F. A. Gunther.
Archives of Environmental Contamination and Toxicology, Vol. 1, No. 1, p 84-96, February 1973. 5 fig, 1 tab, 17 ref.

Descriptors: *Microbial degradation, *Hydrolysis, *Soil analysis, *Separation techniques, Soils, Gas chromatography, Pesticide residues, Organic matter, Flooding, Soil moisture, Path of pollutants.
Identifiers: *Gas liquid chromatography, Persistence, *Parathion chemical, Recovery, Aminoparathion, Sample preparation.

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Six California soils, Mocho silt loam, Linne clay, Madera sandy loam, Laveen loamy sand, Windy loam, and Santa Lucia silt loam, were contaminated with parathion with moisture contents of 40 percent saturation or simulated flooding to investigate parathion persistence. The samples were kept in enameled trays fitted with glass covers for periods up to 8 months. Samples were extracted by adding a benzene-acetone mixture, repeated shaking, decanting the supernatant onto a column of sodium sulfate and collecting the eluate. The recovery of parathion was 95-101 percent. The extracts were analyzed by GLC using an alkali flame ionization phosphorus detector and columns (1.52 m x 3.2 mm o.d.) packed with 10 percent OF-101 on 80/100 mesh Gas Chrom Q for parathion in the presence of aminoparathion or a mixture of 15 percent DC-200 and 15 percent QF-1 separately coated on Gas Chrom Q for aminoparathion. The studies show that most parathion applied to soils disappears rapidly but low levels are retained for long periods. The persistence of parathion is partially dependent on soil type. In Mocho silt loam, Linne clay, Madera sandy loam, and Laveen loamy sand, degradation is rapid and is attributed to a combination of hydrolysis and strong microbial activity that overshadows differences in soil type. In contrast, loss from Santa Lucia silt loam and Windy loam soils is slow and is attributed to hydrolysis. The organic matter contents of the six soils correlate well with the parathion persistence. Parathion disappears faster in the soils with lower organic matter. Parathion degradation did not appear to be greatly accelerated by flooding. (Little-Battelle)
W73-10476

UPTAKE AND BIOTRANSFORMATION OF PHENYLMERCURIC ACETATE BY AQUATIC ORGANISMS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
S. C. Fang.
Archives of Environmental Contamination and Teoxicology, Vol. 1, No. 1, p 18-26, February 1973. 4 fig, 3 tab, 5 ref.

Descriptors: *Bioassay, Absorption, Metabolism, Radioactivity techniques, Radiochemical analysis, Freshwater fish, Aquatic plants, Chemical analysis, Lboratory tests, Water sampling, Organic compounds, Fungicides, Path of pollutants, Tracers, Aquatic weeds, Snails, Aquatic life.
Identifiers: *Phenylmercuric acetate, *Elodea canadensis, *Lebistes reticulatus, *Helisoma campanulata, *Ceratophyllum demersum, *Biotransformation, Biological magnification, Bioaccumulation, Metabolites, Excretion, Fate of pollutants, Hg-203, Slimicides, Electron capture gas chromatography, Scintillation counting, Biological activity, Half-life, Ethylmercuric chloride, Sample preparation, Guppy, Mercury radiosiotopes.

Guppies (Lebistes reticulatus), snails (Helisoma campanulata), elodea (Elodea canadensis), and coontail (Ceratophyllum demersum) were exposed to 0.05-0.5 microM of Hg-203-labeled phenylmercuric acetate (PMA) in order to study the uptake and metabolism of the slimicide by aquatic organisms. Studies were carried out in all glass aquaria with aeration at 25-29 C. A gamma-scintillation spectrometer was used to periodically measure radioactivity in samples of water and organisms. After measuring the total Hg-203 content, samples were homogenized in water containing HCl, extracted with benzene, purified according to the Westoo (1968) method, and analyzed by electron capture gas chromatography. Inorganic Hg-203 content was determined by the Clarkson and Greenwood (1970) method. Some guppies and elodea were placed in fresh water after the uptake period to determine PMA loss rate. The organisms tested were found to readily take up PMA. The PMA uptake was related to the time of exposure and the PMA concentration, the absorbed PMA being mainly converted to inorganic mercury. Ethylmercuric chloride was a minor metabolic product. Mercury-203 was not quickly eliminated from the guppy, elodea, and coontail when they were placed in fresh water, the biological half-life of Hg-203 residues ranging between 43 to 58 days. (Holoman-Battelle)
W73-10477

KINETIC STUDY OF PHOSPHATE REACTION WITH ALUMINUM OXIDE AND KALONITE,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
Y. S. R. Chen, J. N. Butler, and W. Stumm.
Environmental Science and Technology, Vol. 7, No. 4, p 327-332, April 1973. 8 fig, 3 tab, 35 ref.

Descriptors: *Phosphates, *Sediments, *Cydling nutrients, *Kaolinite, Water temperature, Hydrogen ion concentration, Chemical reactions, Kinetics, Clays, Clay minerals, Adsorption, Fluorides, X-ray diffraction, Electron microscopy, Laboratory equipment.
Identifiers: Alumina, Rate constants, Activation energy, Sample preparation.

To better define the role of sediments in cycling nutrients in water systems, the quantitative reaction kinetics of phosphate with clay minerals (alumina and kaolinite) were studied at 25 C and 50 C. Reactions were carried out in cylindrical water-jacketed reaction vessels covered lucite plates to prevent loss of water vapor. Temperature and pH were carefully controlled. Precipitates were examined by electron microscopy and materials were identified by X-ray diffraction. The reaction of aqueous phosphate (approx 0.0003 M) with alumina and kaolinite shows a rapid (12-24 hr) adsorption step followed by a slow process, obeying a first-order rate law, which extends over the next 60 days and probably involves nucleation and growth of a hexagonal A1P04 phase. For kaolinite with 10.7 sq m/g surface area, solids concentration 7.5 g/l, pH equals 4.6, as well as for alpha-A1203 with surface area 10 sq m/g, solids concentration 2.5 g/l, and pH equals 4.3, the first-order rate constant at 50 C is 0.222/day. Increasing temperature increases the rate with an activation energy of 2.4 Kcal/mol. Addition of fluoride ion decreases the amount of phosphate initially adsorbed but does not effect the first-order rate. The rate constant increases proportionally to the solid surface available, and decreases with increasing pH to essentially zero at pH more than or equal to 7. Successive addition of phosphate aliquots to the same sample of solid uses up the sites available for the rapid initial step but does not strongly influence the rate of the slow step. (Little-Battelle)
W73-10479

CHEMICAL EQUILIBRIUM MODELS OF LAKE KEYSTONE, OKLA.,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
C. P. Falls, and L. P. Varga.
Environmental Science and Technology, Vol. 7, No. 4, p 319-327, April 1973. 6 fig, 2 tab, 32 ref.

Descriptors: *Mathematical models, *Water quality, Sediments, Thermodynamic behavior, Depth, Distribution patterns, Water temperature, Dissolved oxygen, Carbon dioxide, Suspended solids, Dissolved solids, Hydrogen ion concentration, Calcium, Magnesium, Strontium, Sodium, Potassium, Bicarbonates, Carbonates, Sulfates, Fluorides, Silica, Sulfides, Chlorides, Montmorillonite, Clays, Illite, Calcite, Quartz, Kaolinite, *Oklahoma.
Identifiers: *Keystone Lake (Okla), *Chemical equilibrium.

A series of equilibrium models were formulated and compared with chemical and physical observations made from May, 1966 to June, 1968. Water properties determined were temperature, dissolved oxygen, dissolved CO2, suspended solids, dissolved solids, pH, and concentrations of Ca, Mg, Sr, Na, K, bicarbonate, carbonate, sulfate, fluoride, silica, sulfide, and chloride. X-ray diffraction of sediments and suspended solids showed the presence of montmorillonite, kaolinite, illite, quartz, and calcite. The models were based on the thermodynamic equilibrium condition of evaporite minerals (halite, gypsum, dolomite, calcite, and SrSO4), clays (kaolinite, sodium montmorillonite, and calcium montmorillonite), and the liquid and gas phases which comprise the Lake Keystone drainage basin. Ten components were calculated by Gibbs phase rule, using analytical data for the total chemical compositions and the available thermochemical data. The model which simulated the experimental data most closely was based on the hypothesis that waters, originally in equilibrium with the common evaporite minerals of the Permian formation within the Arkansas River drainage basin, were diluted by fresher waters not exposed to these minerals as they flowed toward the reservoir. The waters then approached a state of chemical equilibrium with clay minerals which adjusted their final composition. (Little-Battelle)
W73-10480

SEASONAL FLUCTUATIONS OF IONIC COPPER IN KNIGHTS POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
K. D. Kimball.
Limnology and Oceanography, Vol 18, No 1, p 169-172, January 1973. 2 fig, 13 ref.

Descriptors: *Copper, *Path of pollutants, *Seasonal, Water pollution sources, *Water analysis, *Decomposing organic matter, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Hardness (Water), Leaves, Chemical analysis, Spectrophotometry, Ponds, Fluctuations, *Massachusetts.
Identifiers: Sample preparation, Knights Pond (Mass), Bioaccumulation, Transport, Mobilization.

Ionic copper levels in Knights Pond (Mass.) were measured 34 times from April 19, 1971 to March 20, 1972, in order to investigate the copper cycle in this inland pond. DO, pH, temperature, total residue, and Ca-Mg haraness were also measured. Precipitation was measured daily. Copper in samples was complexed with sodium diethyldithiocarbamate, the complex extracted with xylene, and the absorbance of the xylene-chelate determined with a spectrophotometer. Copper concentrations in the pond ranged from below detectability to 105 micrograms/liter over the 11 months. Values were low from summer through late fall, at which time they ascended to their highest level during midwinter and then slowly decreased throughout late winter and spring toward the summer low values again. No significant correlations were found between copper and pH, total residue, or hardness. Moderate linear correlations were found between dissolved oxygen and copper at the surface stations. Copper is apparently concentrated in the vegetation during the growing season and released from the leaf litter by decomposition in the fall. The chemical characteristics of the watershed are unable to completely complex or precipitate this additional copper, resulting in increased concentrations in the pond during fall and winter. (Little-Battelle)
W73-10487

ADSORPTION OF CHLORINATED HYDROCARBONS FROM SEAWATER BY A CROSSLINKED POLYMER,
Woods Hole Oceanographic Institution, Mass.
G. R. Harvey.
Available from the National Technical Information Service as PB-213 954, $3.00 in paper copy, $0.95 in microfiche. Report No. WHOI-72-86, November 1972. 31 p, 2 fig, 2 tab, 16 ref, 1 append. Contract No. EPA-CQ-16020.

Descriptors: *Polychlorinated biphenyls, *Adsorption, *Separation techniques, *Sea water, Water analysis, DDT, DDE, Dieldrin, Filtration, Gas chromatography, Sampling, Atlantic Ocean.
Identifiers: *Amberlite XAD-2, *Sargasso Sea, Aroclor 1254, Recovery, Detection limits, On board analysis, Electron capture gas chromatography.

A synthetic resin, Amberlite XAD2, was evaluated as an adsorption medium for chlorinated hydrocarbons (DDT, DDE, dieldrin, and PCB) in seawater with the objective of developing an analytical method for recovering low concentrations of these compounds. Testing of the resin was conducted with seawater containing dissolved organic carbon (DOC), and DDT, DDE, dieldrin, and PCB. The results with the DOC samples showed that coastal seawater contained about 20 percent hydrophobic organic matter and that at flow rates of 0.7 and 1.4 bed vol./min the resin preferentially adsorbed hydrophobic matter. Recovery of DDE, dieldrin, and DDT from seawater was 125, 108, and 92 percent respectively. The resin showed very good adsorption capacity. Chlorinated hydrocarbons were eluted with acetonitrile and ethanol. Analysis of Woods Hole seawater gave PCB ranges of 7.1 to 35 ppt and DDT ranges of less than 0.1 to 3.3 ppt. Concentrations of PCB's were also determined in water of the North Atlantic Ocean from the surface and various depths. The concentrations averaged 20 ppt. The surface water of the Sargasso Sea contains lower concentrations of PCB than the North Atlantic. The method developed is deemed suitable for seawater analysis and probably for freshwater. It is suggested that the resin could be used for in situ sampling while a ship is underway. (Little-Battelle)
W73-10490

COMPARATIVE STUDIES OF THIN LAYER CHROMATOGRAPHIC SYSTEMS FOR THE SEPARATION AND IDENTIFICATION OF PHOTOALTERATION PRODUCTS OF PARATHION,
Mississippi Agricultural and Forestry Experiment Station, State College.
For primary bibliographic entry see Field 05A.
W73-10493

METHODS OF ESTIMATING THE HALF-LIFE OF BIOLOGICAL ACTIVITY OF TOXIC CHEMICALS IN WATER,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 05C.
W73-10495

STRUCTURE ACTIVITY CORRELATIONS OF BIODEGRADABILITY OF DDT ANALOGS,
Illinois Univ., Urbana. Dept. of Entomology.
I. P. Kapoor, R. L. Metcalf, A. S. Hirwe, J. R. Coats, and M. S. Khalsa.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 310-315, March/April 1973. 4 fig, 5 tab, 15 ref.

Descriptors: *Fish, *Snails, *Biodegradation, *Algae, Absorption, Metabolism, Radioactivity techniques, Invertebrates, Chromatography.
Identifiers: Methoxy-methiochlor, Methyl-ethoxychlor, Chloro-methylchlor, *Biomagnification, Metabolic pathways, Biodegradability index, Macroinvertebrates, Scintillation counting, Oedogonium, Gambusia, Physa, Thin layer chromatography, Partition coefficients, Mosquitofish.

Methoxy-methiochlor (2- (p-methoxyphenyl)-2-(p-methylthiophenyl) - 1,1,1-trichloroethane), methyl-ethoxychlor (2± (p-methylphenyl) - 2- (p-ethoxyphenyl) - 1,1,1-trichloroethane), and chloro-methylchlor (2- (p-chlorophenyl) -2- (p-methylphenyl) - 1,1,1-trichloroethane) were studied for metabolic pathways in mice and insects (salt marsh caterpillar) and for biodegradability in a model ecosystem which included algae, fish, snails, and mosquitoes. The compounds were radiolabeled and radioassayed by scintillation counting. The metabolic products were identified by chromatography. The distribution of metabolites is shown for each organism. All three compounds are highly degradable with methoxy-methiochlor the most fugitive. With Gambusia biomagnifications of undegraded products were 300-fold for methoxy-methiochlor, 333-fold for methyl-ethoxychlor, and 1400-fold for chloro-methylchlor. With snails, the biomagnifications were 3400-fold for methoxy-methiochlor, 42,000-fold for methyl-ethoxychlor, and 21,000-fold for chloro-methylchlor. The percentages of undegraded compound to total ranged from 1 to 25 percent. The pathways of metabolism are illustrated. Methoxy-methiochlor and methyl-ethoxychlor were good substrates for multifunction oxidases and showed biodegradability indices of 2.75 and 1.20, respectively. Chloro-methylchlor was also a satisfactory substrate and showed a biodegradability index of 3.43, compared to 0.015 for DDT. (Little-Battelle)
W73-10504

HYDROLYSIS OF AQUEOUS SOLUTIONS OF SODIUM 2,2-DICHLOROPROPIONATE UNDER SELF-INDUCED ALKALINE CONDITIONS,
Agricultural Research Service, Fargo, N. Dak. Metabolism Lab.
F. S. Tanaka, and R. G. Wien.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 285-288, March/April 1973. 2 fig, 1 tab, 12 ref.

Descriptors: *Dalapon, *Chlorinated hydrocarbon pesticides, *Hydrolysis, *Aqueous solutions, Chemical reactions, *Chemical degradation, *Pollutant identification, Herbicides, Hydrogen ion concentration, Organic acids, Mass spectrometry, Nuclear magnetic resonance.
Identifiers: Sodium 2 2-dichloropropionate, *Flame ionization gas chromatography, *Metabolites, 2 2-Dichloropropionic acid, Gas liquid chromatography, Pyruvic acid, Hydrochloric acid, Infrared spectroscopy, Sodium dalapon, Vacuum distillation.

Aqueous solutions of sodium 2, 2-dichloropropionate were previously reported as having an approximate pH of 5 to 6. The data obtained in this study show that freshly prepared solutions of greater than about 0.9 m concentration exhibit a basic pH. Upon standing, however, these salt solutions become acidic due to the hydrolysis of the 2,2-dichloropropionate to yield pyruvate and hydrochloric acid. The approximate pH of the sodium 2,2-dichloropropionate solutions is estimated at different concentrations, and the rates of pH change due to hydrolysis are reported for a dilute, intermediate, and high concentration of material under mildly alkaline conditions. (Holoman-Battelle)
W73-10506

DYNAMICS OF A SALT OF (2,4--DICHLOROPHENOXY) ACETIC ACID IN FISH, WATER, AND HYDROSOL,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 05C.
W73-10507

BIOLOGICAL NITROGEN FIXATION IN THE GREAT LAKES,
Wisconsin Univ., Madison, Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W73-10511

PRODUCTION OF THE GIANT KELP, MACROCYSTIS, ESTIMATED BY IN SITU INCORPORATION OF C-14 IN POLYENTHYLENE BAGS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
D. W. Towle, and J. S. Pearse.
Limnology and Oceanology, Vol 18, No 1, p 155-159, January 1973. 3 tab, 19 ref.

Descriptors: *Kelps, *Photosynthesis, *On-site investigations, Estimating, *Plant tissues, Marine algae, Marine plants, Phaeophyta, Primary productivity, Laboratory tests, Radioactivity techniques, Carbon radioisotopes, Methodology, Standing crops.
Identifiers: *Macrocystis pyrifera, *Photosynthetic rates, C-14, Scintillation counting, Sample preparation.

Incorporation of C-14 by the giant kelp Macrocystis pyrifera was measured in situ by enclosing individual blades within polyethylene bags in a kelp bed. Incubation were carried out in full sunlight for 3 hr. The contents of the bag were removed to an opaque container, transported to a dimly lit laboratory, and rinsed in unlabeled seawater. Duplicate samples from 3 sections of each kelp blade were solubilized, mixed with H2O2 and added to scintillation fluid for counting. Incorporation was highest in the tips of the blades in the canopy, about 0.315 mg C/g/hr on the basis of wet weight. In the densest part of the kelp bed, total wet standing crop of Macrocystis was about 5.9 kg/sq m, and production of Macrocystis blades in that area was estimated to be at least 6.8 g C/sq m/day, or about 17 g organic matter/sq m/day. (Holoman-Battelle)
W73-10516

STUDIES IN THE COMPLEX FORMATION OF METAL IONS WITH SUGARS. PART I. THE COMPLEX FORMATION OF COBALT (II), COBALT (III), COPPER (II) AND NICKEL (II) WITH MANNITOL,
Oslo Univ. (Norway). Dept. of Chemistry.
J. Dolezal, K. S. Klausen, and F. J. Langmyhr.
Analytica Chimica Acta, Vol 63, No 1, p 71-77, January 1973. 1 fig, 5 ref.

Descriptors: *Heavy metals, *Cations, *Spectrophotometry, *Alkali-aggregate reactions, Chemical reactions, Chelation, Organic compounds, Chemical analysis, Cobalt, Copper, Nickel, Carbohydrates, Manganese.
Identifiers: *Mannitol, *Complexation, Ligands, Absorbance.

The complex formation of mannitol with cobalt (II), cobalt (III), copper (II) and nickel (II) in alkaline media (0.1 to 4 M potassium hydroxide) was studied by spectrophotometry. Cobalt (II) and cobalt (III) reacted with mannitol to form 1:1 complexes; the conditional constant (in 4 M potassium hydroxide) of the former complex was found to be 220,000. The reaction of copper (II) with the sugar gave two complexes. In the range 0.5-4 M potassium hydroxide and with the ligand in large excess, a CuM compound was formed; in mixtures with a small excess or with the reactants present in equimolar amounts, the species Cu2M predominated. In 0.5 M potassium hydroxide, the conditional constant of the latter compound was found to be 63 million. The low stability of the nickel (II) complex (es) with mannitol made it impossible to draw any definite conclusions as to the composition of the species formed in alkaline medium. (Holoman-Battelle)
W73-10524

OXYGEN-CARBON DIOXIDE-NUTRIENTS RELATIONSHIPS IN THE NORTHEASTERN PACIFIC OCEAN AND SOUTHEASTERN BERING SEA,
Oregon State Univ., Corvallis.
S. Alvarez-Borrego.

UNIV. OF ILL. URBANA-CHAMPAIGN

Available from University Microfilms, 300 No. Zeeb Rd. , Ann Arbor Mich., 48106, Order No. 73-7816. Ph D Dissertation, 1973. 186 p.

Descriptors: *Dissolved oxygen, *Carbon dioxide, *Nutrients, *Pacific Ocean, *Model studies, Spatial distribution, Water temperature, Hydrogen ion concentration, Alkalinity, Calcite, Phosphates, Nitrates, Depth, Regression analysis, Mathematical models, Indian Ocean, Chemical precipitation, Calcium carbonate, Salinity, Density.
Identifiers: *Bering Sea, Vertical distribution, Regression coefficients, Multiple linear regression analysis, Seasonal variation, Aragonite, Data interpretation, Dissolution, Oxygen consumption.

The vertical distribution of density, salinity, temperature, dissolved oxygen, apparent oxygen utilization, nutrients, preformed phosphate, pH, alkalinity, alkalinity:chlorinity ratio, 'in situ' partial pressure of carbon dioxide, and percent saturation of calcite and aragonite, for the Southeastern Bering Sea, is studied and explained in terms of biological and physical processes. Some hydrological interactions between the Bering Sea and the North Pacific Ocean are explained. In the Northeastern Pacific Ocean the oxygen-phosphate and oxygen-nitrate relationships for the region of the water column above the oxygen minimum zone vary systematically with latitude. In the entire water column, these slopes vary with depth. An effect on the slopes of the oxyten-phosphate and oxygen-nitrate relationships, similar to that observed when decreasing latitude, is observed when comparing winter versus summer data. The winter slopes are higher than the summer slopes. Multiple regression analysis was applied to the oxygen, phosphate, nitrate, and potential temperature data from stations at different geographic locations in the Pacific and Atlantic Oceans. Confidence intervals for the regression coefficients are consistent with the values predicted by the Redfield model for the delta 02:delta PO4 and delta 02:delta NO3 ratios for biological processes. After the field oxygen, phosphate and nitrate data were found consistent with Redfield's model, preformed phosphates were calculated by using the model, and potential temperature versus preformed phosphates diagrams were constructed for different stations in the Pacific and Indian Oceans to study their water masses. In the Northeastern Pacific Ocean the total inorganic carbon dioxide-oxygen relationship varies with depth. Multiple linear regression analysis was applied to express total inorganic carbon dioxide, normalized to constant salinity, as a function of potential temperature and total alkalinity and oxygen normalized to constant salinity. Results of the regression are in agreement with the assumption that total alkalinity changes in the open ocean are only due to salinity changes in calcium carbonate dissolution or precipitation, and with Redfield's model for the prediction of the total inorganic carbon dioxide-oxygen ratio for the biochemical oxidation. (Holoman-Battelle)
W73-10532

PROCESSES AFFECTING THE OCEANIC DISTRIBUTION OF CARBON DIOXIDE,
Oregon State Univ., Corvallis.
C. H. Culberson.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-3957. Ph D Dissertation, 1972. 188 p.

Descriptors: *Carbon dioxide, *Oceans, *Model studies, *Spatial distribution, *On-site data collections, *Water chemistry, Sea water, Pacific Ocean, Indian Ocean, Atlantic Ocean, Water properties, Path of pollutants, Salinity, Hydrogen ion concentration, Alkalinity, Silicates, Phosphates, Nitrates, Nitrites, Oregon, Organic matter, Oxidation, Dissolved oxygen, Degradation (Decomposition), Calcium carbonate.
Identifiers: *Stoichiometric models.

The stoichiometric model of organic decomposition in seawater (Redfield, Ketchum, and Richards, 1963) was used to describe the oceanic distribution of total carbon dioxide. It was assumed that the concentration of total carbon dioxide was the sum of three terms: (1) the initial concentration of carbon dioxide, (2) the increase in carbon dioxide due to the oxidation of organic matter, and (3) the increase in carbon dioxide due to the solution of calcium carbonate. The vertical and horizontal distribution of total carbon dioxide in the Pacific, Indian, and South Atlantic Oceans was shown to conform to this model. The model for the distribution of total carbon dioxide was applied to the vertical distribution of carbon-13 at the North Pacific (1969) GEOSECS intercalibration station (Kroopnick, Deuser, and Craig, 1970). Values of Delta C-13 calculated from the stoichiometric model agreed to within plus or minus 3 percent with the measured values at this station. Near-bottom chemical measurements were made on three cruises: YALOC-69 to the Eastern Tropical Pacific, Y6908F off the Oregon Coast, and TT-46 to the Caribbean Sea and North Atlantic. Salinity, oxygen, pH, alkalinity, silicate, phosphate, nitrate, and nitrite were measured at heights from 0.5 to 300 m above the bottom. No measurable salinity, oxygen, silicate, phosphate, nitrate, or nitrite gradients were observed. A statistically significant near-bottom increase in pH and alkalinity was found. However, the increase was small and could have resulted from undetected analytical and/or sampling errors. (Holoman-Battelle)
W73-10534

THE UPTAKE, STORAGE, AND RELEASE OF DIELDRIN AND SOME EFFECTS OF ITS RELEASE IN THE FISH, CICHLASOMA BIMACULATUM (LINNAEUS),
Michigan Univ., Ann Arbor.
D. L. Brockway.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-6797. Ph D Dissertation, 1972. 111 p.

Descriptors: *Absorption, *Dieldrin, *Bioassay, *Pesticide toxicity, Laboratory tests, Pesticide residues, Path of pollutants, Fish physiology, Freshwater fish, Chlorinated hydrocarbon pesticides, Insecticides, Water analysis, Chemical analysis, Cichlids, Water pollution effects.
Identifiers: *Bioaccumulation, *Cichlasoma bimaculatum, Mobilization, Excretion, Metabolites, Hormones, Fate of pollutants, Continuous flow technique, Electron capture gas chromatography, Gas liquid chromatography.

The uptake of the pesticide dieldrin from water, its storage in tissues of a tropical fish (Cichlasoma bimaculatum) and its release from storage has been investigated. Several parameters considered to be indicators of the effects on the fish of the release of dieldrin from tissue storage were also measured. Dieldrin in acetone solution was added to water in continuous-flow exposure vessels. The concentration of insecticide in water and fish tissue was measured by electron-capture, gas-liquid chromatography. Blood- and brain-dieldrin concentrations were higher in fish killed by dieldrin than in fish exposed to dieldrin, but not killed. Uptake-release experiments were performed in which fish were exposed to sublethal concentrations (1 or 2 ppb) for up to 34 days. After this exposure, tissue residue levels had nearly reached a plateau. When exposure was terminated, the whole-body residue concentration factors on a wet-weight basis were between 6,000 and 11,000. Whole-body concentrations were higher than brain, and blood concentrations were lowest. After the exposure period, the fish were held in water without dieldrin up to 59 days and subjected to fasting and/or a 5 C temperature rise. During the release period, fasting alone caused only a slow rate of loss of the whole-body dieldrin residues. Fasting plus a 5 C temperature rise produced a more rapid loss of whole-body dieldrin residues. Fish which were fed normally and subjected to the 5 C increase in temperature showed a very rapid loss of dieldrin and little loss of fat. Two types of measurements were made to study the probability of post-exposure sublethal effects: (1) blood- and brain-dieldrin concentrations were measured in juvenile fish, and (2) excretion of 17-OHCS hormone metabolites in urine was measured in catheterized adult fish. During the post-exposure period there was not a significant increase in blood- or brain-dieldrin concentration above the final concentration of the exposure phase. The quantity of hormone metabolite excreted in urine was always higher in fish exposed to dieldrin than in controls after the first day of urine collection. The level of hormone excretion, however, decreased continuously in exposed fish after the first. day. Under the test conditions, there was no evidence that dieldrin was released in toxic quantities when a fish was forced to utilize its fat stores. (Holoman-Battelle)
W73-10536

THE CARBON CYCLE IN THE EPILIMNION OF TWO MICHIGAN LAKES,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05C.
W73-10538

POPULATION DYNAMICS AND THE EFFECT OF INORGANIC IONS ON CERTAIN MICROCRUSTACEA,
Cincinnati Univ., Ohio.
For primary bibliographic entry see Field 05C.
W73-10542

THE RELATIONSHIP BETWEEN IONS AND CILIARY ACTIVITY IN THE GILL OF MYTILUS EDULIS,
Fordham University, Bronx, N.Y.
For primary bibliographic entry see Field 05C.
W73-10543

SIMULTANEOUS QUANTITATION OF SALMONELLA SPECIES AND PSEUDOMONAS AERUGINOSA. I. POLLUTED WATERS. II. PERSISTENCE OF PATHOGENS IN SLUDGE TREATED SOILS. III. ANALYSIS OF WASTE TREATMENT SLUDGES FOR SALMONELLA SPECIES AS A SURVEILLANCE TOOL,
National Environmental Research Center, Cincinnati, Ohio.
B. A. Kenner, G. K. Dotson, and J. E. Smith.
Available from the National Technical Information Serice as PB-213 706, $3.00 in paper copy, $0.95 in microfiche. EPA Report, September 1971. 36 p, 9 tab, 46 ref.

Descriptors: Water pollution, *Sludge treatment, Persistence, *Pathogenic bacteria, *Pollutant identification, *Monitoring, *Isolation, Waste treatment, Sewage treatment, Aerobic bacteria, Soil contamination, Coliforms, Municipal wastes, Sewage effluents, Waste water (Pollution), Mortality, Bioindicators, Soil-borne diseases, Human diseases, Sewage disposal, Sludge disposal, Activated sludge, Sewage sludge, Trickling filters, Sampling, Methodology, Chemical analysis, Path of pollutants, Storm runoff.
Identifiers: *Pseudomonas aeruginosa, *Salmonella spp, Fecal coliforms, Selective media, Serotypes, Survival, Culture media, Agars, Biochemical tests, Salmonella paratyphi A, Salmonella cubana, Salmonella tennessee, Arizona,Ultra-filter MPN method, Most probable number test, Enumeration.

A practical, sensitive, quantitative method for the isolation and enumeration of Salmonellae and pyocyanogenic Ps. aeruginosa from wastewaters, treatment effluents, streams, stormwater runoff, and sludges, in all seasons of the year, is described. The use of glass fiber ultra filters allows

the testing of low turbidity to crystal-clear waters in a range from 1-liter to 10-gallon samples. The methods described are useful for testing treatment plant effluents, streams, well waters, and non-chlorinated drinking waters. An appendix and six tables describe in detail media employed, schemata for five multiple tube methods, quantitative results obtained compared with published qualitative results, and proof for claims made for critical temperature, and the use of glass fiber ultra filters. The persistence of Salmonella species, Pseudomonas aeruginosa, and fecal coliforms in soils treated with various types of municipal sludges is reported. From results obtained testing relatively small soil samples at weekly intervals, it is evident that sludge-borne pathogens may persist on agricultural or grass lands in the top two inches (5 cm) of soil for at least 21 weeks. It is suggested that a more complete and useful surveillance of salmonellosis for large urban areas can be attained by analysis monthly of municipal primary and secondary waste treatment plant sludges. Results obtained can indicate current high carrier rates of certain Salmonella serotypes or suggest the presence of pathogens in local food or feed products that may need inspection to avert spread. (Holoman-Battelle)
W73-10549

STUDY OF THE CONTAMINATION OF ARENICOLA MARINA L. BY COBALT-60, (ETUDE DE LA CONTAMINATION D'ARENICOLA MARINA L. (ANNELIDE POLYCHETE) PAR LM COBALT-60),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Service de Recherches Toxicologiques et Ecologiques.
For primary bibliographic entry see Field 05C.
W73-10551

THE STATE OF MARINE POLLUTION IN THE MEDITERRANEAN AND LEGISLATIVE CONTROLS.
Food and Agriculture Organization of the United Nations, Rome (Italy). General Fisheries Council for the Mediterranean.

Studies and Reviews No 51, 72 p, September 1972. 76 ref.

Descriptors: *Coasts, *Harbors, Water pollution sources, *Sewage, *Domestic wastes, Oil, Pesticides, Radioactive wastes, *Thermal pollution, Floatsam, Suspended load, Bottom sediments, Polychlorinated biphenyls, *Industrial wastes, *Oil pollution.
Identifiers: *Mediterranean Sea.

A questionnaire was sent to all countries bordering the Mediterranean. The questionnaire covered the following subjects: pollution by domestic sewage, industrial pollution, oil pollution, other forms of pollution (such as pesticides, radioactive substances, thermal pollution, floating materials, suspended matter, bottom deposits, and PCBs), and legislation on water pollution. The state of pollution in inshore waters of the Mediterranean has reached a critical level. High quantities of domestic sewage are discharged untreated or insufficiently treated, and industrial effluents carry high organic loads. Almost total absence of control over industrial toxic and solid wastes prevails. The state of pollution in the open sea is almost as severe due to waste dumping, pipeline discharges, and high amounts of pesticides carried out by wind. Oil pollution of the beaches and inshore waters and even of the open sea is common. Discharge of oil residues is still allowed in some areas, and only 5 of 14 harbors have facilities for receiving such residues from tankers. Damage to fishing gear and the palatability of fish is extensive. In most Mediterranean countries insufficient attention is paid to pollution control and to the enforcement of legal regulations. (Ensign-PAI)
W73-10553

POLLUTION IN SOME BRITISH ESTUARIES AND COASTAL WATERS.
Royal Commission on Environmental Pollution, London (England).

Third Report, September 1972. 128 p, 11 fig, 26 tab, 59 ref. 3 append.

Descriptors: *Estuaries, *Pollutants, Rivers, Runoff, *Discharge (Water), *Waste disposal, Tides, Scour, Water pollution control, Management, Regulations, Biota, Benthos, Fisheries, Fish, Governments, Monitoring, Research, Economics, Legislation.
Identifiers: *Great Britain, Wales, Scotland, England.

A great and increasing volume of pollutants reaches British estuaries from rivers and direct discharge, tidal scour cannot indefinitely continue to break down or disperse all such wastes. Estuaries have received too little protection from the British Government, and integration of estuarine pollution control policies with a national policy for waste disposal is suggested. The law should require maximum practical abatement before discharge of all pollutants which are unlikely to be rendered harmless by natural processes. The government should also adopt 2 biological criteria for management of estuarine waters: ability to support mud bottom fauna essential for sustaining sea fisheries and ability to allow passage of migratory fish at all tide states. Monitoring, research, economics, administration, and legislation for Wales, Scotland, and England are considered. (Ensign-PAI)
W73-10554

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE,
Oregon State Univ., Corvallis. School of Oceanography.
N. H. Cutshall.
In: Heavy Metals in the Environment, Seminar, Oregon State University, Water Resources Research Institute, October 5, 1972, Corvallis. p 37-44, January 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Coasts, *Estuaries, *Water pollution effects, *Heavy metals, Trapping, Aquatic life, Biota, Ecosystems, Fisheries.

Whether released to air or water or soil, heavy metal contamination is eventually carried into estuarine and coastal water systems. Estuaries serve as funnels, through which land runoff is transported into the coastal ocean. In some cases estuaries appear to effectively trap or delay a good deal of the heavy metal flux passing through them. Estuaries are also avenues by which anadromous fishes travel from spawning beds to the sea and return. Estuaries are spawning and nursery grounds for a wide variety of coastal organisms. Consequently, adverse changes in estuaries may be reflected in the biota of a broad geographic area beyond the estuary itself. Examples are given that show the complexity of heavy metal cycling in coastal ecosystems and also demonstrate that the role of natural partitioning in the effects of heavy metal contamination is substantial. (Ensign-PAI)
W73-10555

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME 1.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 107, $9.00 paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-207, May 1973, 387 p.

Descriptors: *Bibliographies, *Oil spills, Oil pollution, Oil wastes, Oily water, Water pollution control, Water pollution sources, Water quality, Cleaning, Dispersion, Emulsifiers, Legislation, Oceans, Ships, Pollutant identification, Pollution abatement, Remote sensing, Path of pollutants.

This report, containing 256 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published through 1970. Author and subject indexes are included. (See also W73-10557)
W73-10556

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 108, $10.60 paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-207, May 1973, 446 p.

Descriptors: *Bibliographies, *Oil spills, Oil pollution, Oil wastes, Oily water, Water pollution control, Water pollution sources, Water quality, Cleaning, Dispersion, Emulsifiers, Legislation, Oceans, Ships, Pollutant identification, Pollution abatement, Remote sensing, Path of pollutants.

This report, containing 298 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published in 1971-1972. Author and subject indexes are included. (See also W73-10556)
W73-10557

NITRATE REDUCTION IN THE VICINITY OF TILE DRAINS,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
L. A. Davenport, W. D. Lembke, and B. A. Jones.
Available from the National Technical Information Service as PB-221 020, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana Research Report No 64, March 1973. 107 p, 30 fig, 10 tab, 25 ref. 2 append. A-044-ILL (1). 14-31-0001-3513.

Descriptors: *Denitrification, *Drainage, *Nitrates, Porous media, Temperature, Water pollution control, *Tile drains, Path of pollutants.
Identifiers: *Substrate materials, *Temperature effects, *Methanol.

The fate of nitrates as they travel through a long porous column at a slow rate was observed in this study with temperature and substrate materials variable. During a one month period of flow with pore velocities averaging up to 21 centimeters per day, losses as high as 89 percent were found for a methanol treatment at 24 degree C while for 13 degree C losses were reduced to 46 percent. A sawdust substrate material resulted in very little reduction of nitrate concentrations at 24 degree C and actual increases (presumably from mineralization) at 13 degree C. Since methanol was found to be an effective means of removing nitrate from a slowly moving stream of water at temperatures as low as 13 degree C, it will be used as a standard in future field studies to evaluate less expensive substrate materials.
W73-10560

UNIV. OF ILL. URBANA-CHAMPAIGN

A PROTOTYPE TOTALISING CURRENT-METER (MARK II); A SELF-MOORED VERSION FOR NEAR-SURFACE USE ESPECIALLY IN FOUL WATER ESTUARIES IN CONNECTION WITH POLLUTANT DISPERSAL STUDIES,
National Inst. of Oceanography, Wormley (England).
J. N. Carruthers.
Bulletin, Institut Oceanographique, Monaco. Vol 70, No 1418, 15 p. 1972. 2 fig, 7 ref.

Descriptors: *Pollutants, *Dispersion, *Currents (Water), *Current meters, Design data, Estuaries.
Identifiers: Totalizing self-moored current-meter, Mark II.

A new self-moored totalizing current meter was made expressly for recording the totality of upper water movements in eight directions over a period of a week or more for application to questions of pollutant dispersal. The instrument is entirely mechanical and works on the Ekman ball-dropping principle. The various features of the instrument are described. Observations made with the instrument have lasted for about 14 days, but the time could be doubled or tripled by using a bigger hopper. Important features of the instrument include the facts that no dirt can get into the working parts which are enclosed in a fabric bag and the instrument can not foul its own moorings as it rides over them at slack water or change of tidal direction. (Ensign-PAI)
W73-10580

AN ECOLOGICAL STUDY OF THREE FRESH WATER PONDS OF HYDERABAD-INDIA: II. THE ENVIRONMENT,
Osmania Univ., Hyderabad (India). Hydrobiology Lab.
For primary bibliographic entry see Field 05C.
W73-10625

RANUNCULUS FLUITANS LAMARCK IN LYON,
C. Forestier.
Bull Mens Soc Linn Lyon. Vol 41, No 6, p 120-124. 1972. Illus.
Identifiers: *France (Lyon), Putrefaction, *Ranunculus-Fluitans, *Rhone River.

The presence of R. fluitans in the Rhone River at Lyon (France), where it has been spreading remarkably for 2 or 3 yrs. is reported for the first time. The cause of this invasion was attributed to the action of the Pierre-Benite hydroelectric dam which reduced the water flow rate and limited the low water phenomena that used to occur frequently in times of little rainfall. The colonization of this plant does not present any threat to navigation in this case, although it may cause an accumulation of debris and various objects to areas where colonization is heavy. However, destruction of these plants would be unwise since they play an important role in the degradation of putrid matter released into the slowed-down currents.--Copyright 1973, Biological Abstracts, Inc.
W73-10646

SOME ECOLOGICAL ASPECTS OF A NESTING COLONY OF HERONS,
Auburn Univ., Ala.
For primary bibliographic entry see Field 02H.
W73-10651

ACCUMULATION OF FALLOUT CESIUM 137 IN SOILS AND SEDIMENTS IN SELECTED WATERSHEDS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. R. McHenry, J. C. Ritchie, and A. C. Gill.
Water Resources Research, Vol 9, No 3, p 676-686, June 1973. 3 fig, 9 tab, 17 ref. AEC-AT (49-7)-3029).
Descriptors: *Tracers, *Sedimentation, *Fallout, *Cesium, Reservoirs, Bottom sediments, Sampling, Erosion, Soil erosion, Sediment yield, Radioactivity techniques, Adsorption, Path of pollutants, Radioisotopes.
Identifiers: Gamma ray spectrography.

The fallout of radioisotopes produced in nuclear explosions provides tracers for following the movement of soil particles in the sedimentation cycle. Cesium 137, which is strongly adsorbed by most soil particles, was identified in sampled soils and sediments. The concentration of Cs-137 ranged from 0.01 to 3.28 pci/g in soils and from 0.01 to 10.05 pci/g in sediments. Uranium, thorium, and potassium were determined simultaneously with Cs-137. Total potassium ranged from a tracr to 5.4%, uranium from 0.5 to 9.4 ppm, and thorium from 1.9 to 42.0 ppm. The concentration of Cs-137 in reservoir sediments varied with depth. In some reservoirs the years of greatest Cs-137 fallout were correlated with layers containing peak concentrations of Cs-137 in the sediment profile. The occurrence of Cs-137 in sediments was significantly correlated with the amount of clay and of organic matter present. The amount of Cs-137 was greater per unit area in sampled sediments than in the contributing watersheds, and the relative concentration factor was as large as 24. This accumulation of Cs-137 in reservoir sediments is indicative of the pollution possible in reservoirs as a result of fallout within the watershed but not necessarily within the reservoir. (Knapp-USGS)
W73-10667

CHLORIDE BALANCE OF SOME FARMED AND FORESTED CATCHMENTS IN SOUTHWESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia).
For primary bibliographic entry see Field 02K.
W73-10669

LEAD OUTPUTS IN STREAMFLOW FROM A WATERSHED ECOSYSTEM,
Illinois Univ., Urbana, Dept. of Forestry.
G. Rolfe, and J. Edgington.
Water Resources Bulletin, Vol 9, No 2, p 372-375, April 1973. 1 fig, 1 tab.

Descriptors: *Lead, *Path of pollutants, Urban hydrology, *Illinois, Water pollution sources, Environmental effects, Data collections, Hydrologic data, Water quality.
Identifiers: *Champaign-Urbana (Ill).

The movements and effects of lead are studied in an 86 sq mi watershed ecosystem at Champaign-Urbana, Illinois. The objectives are to understand and mathematically model the movements and effects of lead in an ecosystem. The system is drained by the Saline Branch Drainage Ditch, a rural stream draining the agricultural area to the north of the cities and Boneyard Creek, an urban stream draining Champaign and Urbana. The two streams join on the northeast edge of Urbana and leave the watershed on its southeastern edge. Lead emitted through the combustion of gasoline containing tetraethyl lead is considered the predominant source (95%) of lead input to the ecosystem. Preliminary estimates, based on traffic volumes and gasoline consumption, indicates approximately 2,340 kg of lead input to the ecosystem every 30 days. Approximately 70% of these emissions occur in the Urbana-Champaign area. The primary avenue of exit for lead from the watershed is through streamflow, including lead associated with suspended sediments. Only about 2%-3% of the lead input is exiting through the water system. This indicates a large buildup of lead in ecosystems of this type. Possible accumulation points in the ecosystem include stream-bottom sediments, soils, and biota. (Knapp-USGS)
W73-10673

PRECISE WATER VELOCITY MEASUREMENTS USING PHOTOGRAMMETRIC TECHNIQUES,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
P. R. Wolf, and T. J. Keating.
Water Resources Bulletin, Vol 9, No 2, p 312-319, April 1973. 3 fig, 6 ref.

Descriptors: *Mixing, *Currents (Water), *Thermal pollution, *Photogrammetry, *Aerial photoraphy, Velocity, Streamflow, Heated water, Remote sensing, *Lake Michigan.

Horizontal surface and subsurface water velocities in thermal plumes were studied using time lapse aerial photography and analytical photogrammetric techniques. Drogues were placed in an effluent plume. Photographic coordinates of drogue images were measured using a glass scale. From the photo coordinates and the results of a groud control survey, positions of drogues in the water were analyzed at known intervals of time. Drogue positions were mapped for selected exposures thereby providing a visual display of velocity vectors in the study area. A rigorous error analysis was performed to determine the validity of the computed results. (Knapp-USGS)
W73-10678

OIL ON PUGET SOUND, AN INTERDISCIPLINARY STUDY IN SYSTEMS ENGINEERING,
Washington Univ., Seattle. Coll. of Engineering.
J. Vagners, and P. Mar.
Available from NTIS, Springfield, Va., 22151 as COM-72-11251. Price $9.00 printed copy, $0.95 microfiche. Washington University Press, Seattle, 1972. 648 p, 114 fig, 58 tab, 91 ref, 14 append.

Descriptors: *Oil spills, *Water pollution sources, *Sounds, *Washington, *Water pollution control, Water quality, Ecosystems, Aquatic life, Oil industry, Oil pollution, Oily water, Pollution abatement, Path of pollutants, Winds, Currents (Water), Reviews, Publications, Bibliographies, Industrial wastes.
Identifiers: *Puget Sound (Wash).

A six-month interdisciplinary course was formulated to study the prevention and control (containment and cleanup) of oil spills in Puget Sound. The report evaluates the current status of oil spill prevention and control in Puget Sound and suggests recommendations to alleviate any noticeable deficiencies. Section one presents information on the oil spill statistics and notes on prevention and control. The second section presents a description of Puget Sound and its industries. The third section deals with the prevention and control of oil spills. A bibliography and a list of sources of unpublished information are included. Fourteen appendices contain supportive information and data. (Woodard-USGS)
W73-10684

NOTES ON DEVELOPING GROUND WATERS,
International Water Supply Association, Montreal (Quebec).
For primary bibliographic entry see Field 04B.
W73-10711

WHAT IS THE ROLE OF FLOOD FLOWS IN THE POLLUTION OF THE CONNECTICUT RIVER AND ITS AMELIORATION,
Massachusetts Univ., Amherst.
C. J. Libbey, and W. Litsky.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area. Massachusetts Water Resources Research Center, Publication No. 25, 1973. Appendix E, 14 p, 5 fig, 2 tab. OWRR C-2169 (No. 3377) (1).

Descriptors: *Water quality, *Regression analysis, Coliforms, Suspended solids, Flood flow, Urban

runoff, Runoff, Biochemical oxygen demand, *Connecticut River, *Diversion, *Inter-basin transfers, Massachusetts.
Identifiers: Enfield Dam, Northfield (Mass.).

This appendix provides an analysis of available data on BOD, suspended solids, and coliform concentrations in relation to river flows for the Connecticut River. Storm or flood flows not only provide more water for the dilution of pollutants but also contribute large quantities of pollutants as they flush urban and rural lands and cause combined sewer overflows. Thus, the diversion of flood waters may have a significant effect on river water quality. Data from the Connecticut River at the Enfield Dam and at Northfield were studied using regression analysis and several graphs and tables are presented. The findings include: (1) Enfield which is below sewage treatment plants had high levels of BOD and coliform concentrations while Northfield which is in an agricultural area had high levels of suspended solids; (2) the BOD coliform levels varied inversely with the river flows; (3) the proposed diversion of flood waters will be an important factor in the quality of the river flow but the exact effects can not yet be estimated; and (4) a comprehensive river sampling program is needed. (See also W73-10726). (Elfers - North Carolina).
W73-10731

SALINITY PROBLEMS OF IMPOUNDMENTS AND THEIR MANAGEMENT,
Agricultural Research Service Chickasha, Okla. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05G.
W73-10734

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-10744

DYNAMICS OF MINERAL AND ORGANIC PHOSPHORUS IN THE SEA OF AZOV AFTER, REGULATION OF DON RIVER FLOW (DINAMIKA MINERAL'NOGO I ORGANICHESKOGO FOSFORA V AZOVSKOM MORE POSLE ZAREGULIROVANIYA STOKA REKI DONA),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).
For primary bibliographic entry see Field 02K.
W73-10782

'IRON WATER' FROM WELLS: CAUSES AND PREVENTION,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-10785

SURVIVAL OF MAIZE BACTERIAL STALK ROT PATHOGENS IN INFECTED TISSUE UNDER DIFFERENT MOISTURE AND TEMPERATURE CONDITIONS,
Udaipur Univ. (India). Agricultural Experiment Station.
For primary bibliographic entry see Field 03F.
W73-10800

STUDY ON THE ACOUSTIC CHARACTERISTICS OF UNDER-WATER: FLOATING MUD-I, (IN JAPANESE),
Tokai Univ., Tokyo (Japan). Coll. of Marine Science and Technology.
K. Ogawa, A. Tsuchiya, and M. Nishimura.
J Coll Mar Sci Technol Tokai Univ. 6. p 1-17. 1972. Illus. English summary.
Identifiers: Acoustic studies, Coastal waters, *Japan, Method, *Mud (Floating), Pollution, Sea water, Ultrasonics, Water pollution sources.

Floating mud is a pollution factor in coastal sea water around Japan. Since composition and distribution of particles contained in the floating mud layer may vary depending on time, location and sea state, the usual marine observation method which requires much time and effort should not be effective to determine and analyze behavior of floating mud layer. To resolve such problems, an ultrasonic reflection method was developed to detect and to observe the floating mud layer. Tank and field experiments indicate that echoes of floating mud layer correspond closely to the underwater optical, thermal or chemical vertical distribution. The dependence between decrease of acoustic reflection loss on floating mud layer and increase of acoustic frequency as well as concentration of floating mud is observed. Similar relationship for acoustic reflection loss is calculated through Ament's theoretical formula giving the value of density and acoustic velocity of the sample collected in sea water. Concentration of floating mud layer can be evaluated by measuring acoustic reflection loss of this layer.--Copyright 1973, Biological Abstracts, Inc.
W73-10803

GROUNDWATER CONTAMINATION IN THE CORTARO AREA, PIMA COUNTY, ARIZONA,
Harshbarger and Associates, Tucson, Ariz.
K. D. Schmidt.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 95-111, (1972). 5 fig, 9 ref.

Descriptors: *Groundwater, *Water pollution, *Nitrates, *Irrigation wells, *Sewage disposal, Sewage treatment, Effluents, Groundwater recharge, Sewage lagoons, Sanitary engineering, Landfills, Septic tanks, Agricultural runoff, Geologic investigations, Flow nets, Analysis, Chlorides, Water wells, Seasonal, Hydrographs, Water management (Applied), Arizona, Arid lands.

High concentrations of nitrate have been found in water samples from irrigation wells north of the Tucson Arizona Sewage Treatment Plant. The plant, which had primary treatment prior to 1951, produced 2,800 acre-feet of effluent in 1940, 4,600 acre-feet in 1950, 16,300 acre-feet in 1960, and 33,000 acre-feet in 1970. Large amounts of treated effluent recharge the groundwater system north of the plant. Sources of nitrate contamination beside sewage effluent may be sewage lagoons, sanitary landfills, meat packing and dairy effluent, septic tanks, and agricultural runoff. Sewage effluent is considered to be the primary source of nitrate contamination in the area. Geologic and flow net analysis indicate that aquifer conditions minimize the effects of sewage effluent contamination. Chloride and nitrate migration appears to be similar in the aquifer. Large-capacity wells were sampled to reflect regional conditions, and chemical hydrographs of chloride and nitrate were analyzed. The seasonal nature of these hydrographs patterns depend on total nitrogen in sewage effluent. Management alternatives are suggested to decrease nitrate pollution by sewage effluent. (See also W73-10818) (Popkin-Arizona)
W73-10826

OCCURRENCE OF SOME CHLORINATED ALIPHATIC HYDROCARBONS IN THE ENVIRONMENT,
The Univ. (England). Dept. of Oceanography.
A. J. Murray, and J. P. Riley.
Nature, Vol 242, No 5392, p 37-38, March 2, 1973. 2 tab, 5 ref.
Descriptors: Water analysis, *Sea water, *Pollutant identification, Organic compounds, Ecological distribution, Chemical analysis, Methodology, Atlantic Ocean, Air pollution, Water pollution.
Identifiers: *Electron capture gas chromatography, *Chlorinated hydrocarbons, *Aliphatic hydrocarbons, Sample preparation, Accuracy, Methyl chloride, Chloroform, Carbon tetrachloride, Trichloroethylene, Tetrachloroethylene.

Preliminary data are presented on the environmental (air and water) distribution of aliphatic chlorocompounds. The chlorinated hydrocarbons are stripped from 10- to 100-ml water samples by bubbling with nitrogen and are retained in a cooled silicone packed trap for analysis by electron capture gas chromatography. The coefficient of variation of the method was less than 15 percent. Analyses carried out on samples of surface waters from the North East Atlantic showed the presence of significant amounts of the same principal chlorinated hydrocarbons that were detected in the air samples. (Holoman-Battelle)
W73-10850

HEAVY METALS IN BRITISH WATERS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
A. Preston.
Nature, Vol 242, No 5393, p 95-97, March 9, 1973. 1 fig, 4 tab, 15 ref.

Descriptors: *Heavy metals, *Sea water, *Path of pollutants, Research and Development, Distribution, Copper, Manganese, Nickel, Lead, Zinc, Copper, Cadmium, Commercial fish, Commercial shellfish, Atlantic Ocean, Marine fish, Metabolism, Kinetics, Ecological distribution.
Identifiers: *England, *Coastal waters, *Fate of pollutants, Seaham Harbor, Irish Sea, Severn Estuary, Fucus, Muscle, Marine environment.

The program of research and development on heavy metals in the marine environment, conducted by the Ministry of Agriculture, Fisheries and Food, has two chief objectives: (1) the establishment and continued monitoring of concentrations in fish and shellfish of commercial importance in Britain to provide a basis for estimates of human intake of heavy metals and (2) to provide data to assist an understanding of the behavior of heavy metals when they are introduced into the marine environment--the factors determining their geographical distribution, or biological fate, including their effect, if any, on marine resources and the kinetics of their metabolism in representative marine organisms. The results of seawater sampling on a pilot scale around the British Isles show that contamination is restricted to a few areas, chiefly, but not exclusively, linked to industrial development, and that even in these areas contamination does not spread very far offshore. Monitoring of commercial fish species shows that, except for sedentary shellfish, variations in inshore seawater metal concentrations are not reflected to any great extent in the edible portions of these species. Of course concentrations in inshore fish are sometimes higher than those in offshore fish, especially in the case of Cd, Hg, and Pb. This strongly indicates that metal pollution problems are essentially national or regional problems. (Holoman-Battelle)
W73-10851

MICRODETERMINATION OF FORMIC, OXALIC AND ACETIC ACIDS IN THEIR MIXTURE BY SELECTIVE OXIDATION,
Allahabad Univ. (India). Chemistry Labs.
For primary bibliographic entry see Field 05A.
W73-10860

THE DISTRIBUTION OF HEAVY METALS IN SEDIMENTS OF SORFJORD, WEST NORWAY,
Edinburgh Univ. (Scotland). Grant Inst. of Geology.

UNIV. OF ILL. URBANA-CHAMPAIGN

J. M. Skei, N. B. Price, S. E. Calvert, and H. Holtedahl.
Water, Air, and Soil Pollution, Vol 1, No 4, p 452-461, September 1972. 7 fig, 5 tab, 15 ref.

Descriptors: *Heavy metals, *Bottom sediments, *Soil analysis, *Pollutant identification, *X-ray fluorescence, Distribution, Sampling, Aquatic soils, Chemical analysis, Fjords, Cadmium, Copper, Lead, Zinc, Cores, Water pollution sources, X-ray analysis.
Identifiers: *Norway (Sorfjord), Silver, Barium, Bismuth, Indium, Antimony, Tin.

Sediment cores were taken from 16 sites in Sorfjord, West Norway and frozen. The surface 2-cm sections were sampled, dried, and ground for chemical analysis by X-ray fluorescence for the presence of Ag, Ba, Bi, Cd, Cu, In, Pb, Sb, Sn, and Zn. Unusually high concentrations were found; the concentrations of Zn and Pb reached approximately 10 percent by weight in some sediments. The concentrations of most of the elements were positively correlated, those of Pb, Cd, and Cu with Zn being particularly well developed; correlations also existed between Sb and Zn, and Ag and Cu. The concentrations of the metals in the bottom sediments decreased southwards and northwards from a locality close to a source of industrial waste. (Holoman-Battelle)
W73-10865

ABSORPTION OF AMMONIA FROM ATMOSPHERIC PLUMES BY NATURAL WATER SURFACES,
National Environmental Research Center, Research Triangle Park, N.C.
K. L. Calder.
Water, Air, and Soil Pollution, Vol 1, No 4, p 375-380, September 1972. 1 fig, 5 ref.

Descriptors: *Ammonia, *Absorption, *Mathematical models, *Path of pollutants, Model studies, Diffusion, Gases.
Identifiers: *Atmospheric transport, *Water surfaces.

A simple model is presented that incorporates the major features of atmospheric transport and diffusion of a NH3 plume together with aqueous absorption as the plume traverses a water surface. The model is based on the well-known concept of the deposition velocity, although empirical data concerning the latter is quite meager. A specific application is considered to the gas release from a NH3 stripper of a hypothetical sewage treatment plant, and it is concluded that NH3 absorption by adjacent water masses could be considered. (Holoman-Battelle)
W73-10867

HALOGENATED HYDROCARBONS IN AND OVER THE ATLANTIC,
Reading Univ. (England). Dept. of Applied Physical Sciences.
J. E. Lovelock, R. J. Maggs, and R. J. Wade.
Nature, Vol 241, No 5386, p 194-196, January 19, 1973. 2 fig, 1 tab, 6 ref.

Descriptors: *Water pollution, *Water analysis, *Sea water, *Atlantic Ocean, Air pollution, Gases, Organic compounds, Pollutant identification, Water pollution sources, Ecological distribution.
Identifiers: *Halogenated hydrocarbons, *Electron capture gas chromatography, Methyl iodide, Carbon tetrachloride, Aliphatic hydrocarbons, Halomethanes.

A study conducted to compare the observed global distribution of CC13F (a propellant solvent) with the predicted distribution from models of the behavior of an ideal inert gas revealed two halomethanes: methyl iodide and carbon tetrachloride. These 2 compounds and CC13F were uniformly distributed both in air and sea. Analyses were made by gas chromatography using a new electron capture detector which is capable of coulometric measurements. All three gases were found in the air and in the sea wherever and whenever they were sought. CC13F is one of the few substances present and easily measured in the air which is wholly anthropogenic in origin. CH3I is probably a singular product of marine biology and may be a key compound in the natural cycle of iodine between the seas and the land. CC14 seems very likely to be a product of natural inorganic chemistry, possibly the reaction of methane in the troposhere with chlorine in a complex sequence of reactions. This substance also is passed through the environment in quantities exceeding 1 megaton annually. (Holoman-Battelle)
W73-10873

DISTRIBUTION OF VIBRIO PARAHAEMOLYTICUS IN THE NATURAL ENVIRONMENT,
Washington Univ., Seattle. Inst. for Food Science and Technology.
J. Liston, and J. Baross.
Journal of Milk and Food Technology, Vol 36, No 2, p 113-117, February 1973. 5 tab, 35 ref.

Descriptors: *Distribution patterns, *Water pollution effects, Water pollution sources, Path of pollutants, Shellfish, Foods, Sea water, Estuarine environment, Water temperature, Population, Sediments, Plankton, Fish, Organic matter, Oysters, Shrimp, Crabs, Clams, Public health, Coasts, Pacific Ocean, Atlantic Ocean, Reviews, Gulf of Mexico, Pathogenic bacteria, Enteric bacteria, Marine bacteria, Indian Ocean, Hawaii, Australia.
Identifiers: *Vibrio parahaemolyticus, *Tissue, *Macroinvertebrates, Japan, China Sea, Korea, Taiwan, Ceylon, Germany, Denmark, Holland, England, Baltic Sea, Adriatic Sea, France, Spain, Phillipines, India, China.

Vibrio parahaemolyticus has been isolated widely from marine environments but appears to be most abundant in inshore and estuarine areas when ambient temperatures rise seasonally to levels permitting growth of the organism. Japanese and U.S. studies of coastal areas have shown a direct relationship between temperature and abundance of Vibrio parahaemolyticus and this correlates with the seasonal incidence of Vibrio parahaemolyticus food poisoning in Japan. The organism has been isolated from water, sediment, plankton, fish and shellfish. In North America it seems to be most abundant in molluscan shellfish and in waters of high organic content. Counts of 10-200/ml of water, 1-7/g of sediment and up to 100,000/g of oyster tissue have been reported for North American inshore areas. Limited information on market seafood samples indicates very low incidence of Vibrio parahaemolyticus on fin fish in Europe and North America and high incidence in Japan during summer months. Limited data on market samples of frozen and fresh shellfish in U.S.A. suggest sporadically high incidence on shrimp, crabmeat, oysters, and clams. (Little-Battelle)
W73-10875

ECOLOGICAL SIGNIFICANCE OF THE DISCHARGE OF TREATED WASTE WATERS INTO COASTAL WATERS,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05C.
W73-10876

CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY,
Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab.
J. F. Orsborn.
Copy available from GPO Sup Doc as EP1.23/2:72-078, $1.25; microfiche from NTIS as PB-221 248, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-078, October 1972. 64 p, 30 fig, 3 tab, 35 ref. EPA Project 16080 ERP.

Descriptors: *Hydraulic models, *Computer models, Lakes, Tidal effects, Eutrophication, Water resource development, *Columbia River, Water quality, Washington, Path of pollutants.
Identifiers: *Lake restoration, Enhancement, *Vancouver Lake (Wash).

The effects of possible modifications to the Vancouver Lake-Columbia River System on the hydraulic characteristics of that system were tested in a physical hydraulic model. A mathematical model was developed for predictive analysis and to expand the results of the hydraulic model study. Alternate methods for improving flushing action through Vancouver Lake by use of a conduit were investigated. The theories, assumptions, test procedures, data analysis and results as presented are directed towards arriving at conclusions and recommendations regarding proposed hydraulic engineering works and their effects on the hydraulic regime and water quality conditions in Vancouver Lake. The tests were conducted to determine the hydraulic characteristics and the flushing efficiency of pollutants by using a fluorescent dye to simulate the soluble conservative pollutants in the prototype. In addition, the hydraulic model study provided information on the dispersion, mixing, dilution rates and detention times which are important factors influencing water quality. This is Part 1 of a two-part study entitled 'Correlated Studies of Vancouver Lake, Washington.' The other part of the study is Water Quality Prediction conducted by the Sanitary Engineering Section of the College of Engineering Research Division at Washington State University under Project No. 16080 ERQ, details of which are covered in a separate report. (EPA) (See also W73-10882)
W73-10881

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STUDY,
Washington State Univ., Pullman. Dept. of Civil Engineering.
S. K. Bhagat, W. H. Funk, and D. L. Johnstone.
Copy available from GPO Sup Doc as EP1.23/2:72-111, $2.00; microfiche from NTIS as PB-221 249, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-111, November 1972. 97 p, 29 fig, 6 tab, 7 ref. EPA Project 16080 ERQ.

Descriptors: Water Quality, *Simulation analysis, *Water Quality Control, Eutrophication, *Dredging, Mud, Washington, *Hydraulic models, *Computer models, Bottom sediments.
Identifiers: *Lake restoration, Lake flushing, *Vancouver Lake (Wash).

This study deals with the restoration of water quality of shallow, polluted, and eutrophic lakes. Dredging and removing of lake bottom sediments and introducing better quality water are the restoration measures explored. Vancouver Lake, Washington, was used as a test case. Hydrologic, hydrographic, hydrodynamic, and water quality information, provided by separate but correlated studies, was combined with the aid of mathematical simulation models. Dissolved oxygen was used as an indicator of the overall water quality in the system. Photosynthesis, atmospheric reaeration, biological respiration, and advection were mechanisms considered in the computation of diurnal changes in dissolved oxygen level. In addition to the DO model, the aquatic life model for computing time-varying levels of phytoplankton and bacteria was also tried. The validity of these models was verified with the actual field data. After verifications of the models under the existin
W73-10882

UNRECORDED POLLUTION SOURCES AND OPTIMUM WATER QUALITY SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr., J. V. Hunter, and S. L. Yu.
In: Proceedings of a national symposium, 'Costs of Water Pollution Control,' North Carolina Research Triangle Universities and Environmental Protection Agency, Raleigh, North Carolina. April 6, 7, 1972, p 101-113 (1972). A-025-NJ (2).

Descriptors: *Organic loading, *Urban runoff, Water quality, Water pollution sources, *New Jersey, *Biochemical oxygen demand, Municipal wastes, Industrial wastes.
Identifiers: *Mass balance analysis, *Unrecorded waste loading, *Water quality modelling, Unrecorded pollution, Nonpoint pollution sources.

It is coming to be generally recognized that there are very large waste loadings in rivers in developed areas, over and above the recorded treatment plant effluents. The origins of unrecorded pollution in developed areas, the policy implications for regional water quality planning, and the method of modelling organic pollution by means of BOD mass balance analysis are discussed. Some 'background' waste loading occurs even in totally undeveloped areas. In level cropped areas and areas of individual family housing in New Jersey, BOD concentrations in dry weather averaged less than 2.0 mg/1 and in wet weather less than 3.0 mg/1. In a residential area which has considerable industry, unrecorded dry weather BOD concentrations averaged 9 mg/1 and wet weather BOD 17. Mass balance analysis will usually be required in order to determine unrecorded BOD in urban areas, unless the entire watershed is urban. The process is basically simple, but, for accuracy, account should be taken of the deviations of the BOD rate from the usually assumed first order reaction.
W73-10889

PESTICIDE-SEDIMENT-WATER INTERACTIONS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
H. B. Pionke, and G. Chesters.
Journal of Environmental Quality, Vol 2, No 1, p 29-45 January-March, 1973. 9 fig, 1 tab, 150 ref. OWRR B-016-WIS (16). ARS 12-14-100-8154 (41).

Descriptors: *Pesticides, *Sediments, Aquatic soils, Water pollution sources, Limnology, Aquatic plants, Balance of nature, *Sediment-water interfaces, *Lake sediments, *Reviews.

Pesticide-sediment-water interactions occurring within a watershed and the associated aquatic system are reviewed regarding their impact on the distribution and persistence of pesticides in recipient lakes. Pesticidal persistence on the watershed is discussed initially because the aquatic residue hazard depends largely on the persistence of soil-applied pesticides. Mechanisms of transport from field to aquatic system are reviewed for those compounds not degraded rapidly to nontoxic derivatives. Pesticide transport through the atmosphere, ground water, and surface runoff is traced with particular emphasis on application-associated losses and transport effect on initial pesticide distribution and concentration in the aquatic system. Field and plot studies evaluating pesticide losses in runoff are summarized. Within the aquatic system, limnological, sediment and water characteristics potentially alter the distribution of adsorbed pesticide between water and associated sediment within the lake. Specifically, the effects of pH, lake stratification, characteristics and content of sediment organic matter and clay, and salinity are evaluated. This review concluded with a discussion of literature on pesticide persistence determined in simulated or natural aquatic systems and the interactions between aquatic vegetation, sediment, and water which affect pesticide distribution.
W73-10892

A NOTE ON THE PREDICTION OF BOD PROFILE DUE TO A SOURCE OF EFFLUENT DISCHARGED IN A UNIFORMLY FLOWING STREAM,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
Y. L. Lau.
Water Research, Vol 6, No 7, p 749-757, 1972. 3 fig, 7 ref.

Descriptors: *Diffusion, *Mathematical models, *Biochemical oxygen demand, *Effluents, Streams, Flow profiles, Velocity, Distance, Dispersion, Width, Pollutants, Equations.
Identifiers: Point source model, Plug flow model, Finite width source.

Discharge from a source of pollutant into a uniform stream is analyzed using the two-dimentional diffusion equation with a source of finite width and uniform concentration. Neither the point source model nor the plug flow model can give accurate enough predictions until the concentration has been reduced to a small fraction of the initial value. The danger of not using the proper source strength when applying the point source and plug flow solutions is illustrated. Very close to the source, the plug flow solution can be used to approximate the maximum concentration assuming a certain source of concentration across the whole river. If the effluent concentration is high enough so that far downstream, after the pollutant has essentially dispersed, the concentration level is still significant, the plug flow model can again be used. The distance required for lateral mixing is dependent upon stream characteristics and width of source. It also varies with degree of cross-stream variation one can tolerate. Although the plug flow model can give satisfactory approximation under special circumstances, the finite width source solution should be used since the expression is still very simple and the error function has been well tabulated. (Jones-Wisconsin)
W73-10937

RELEASE OF AMMONIUM-N FROM SEDIMENTS TO WATERS,
Wisconsin Univ., Madison. Dept. of Soil Science.
B. H. Byrnes, D. R. Keeney, and D. A. Graetz.
International Association of Great Lakes Research, Proceedings 15th Conference on Great Lakes Research, p 249-259, 1972. 3 fig, 7 tab, 13 ref.

Descriptors: *Ammonia, *Sediments, *Freshwater, Lakes, Wisconsin, Eutrophication, Nitrogen, Nutrients, Sediment-water interchange.
Identifiers: Lake Mendota (Wis.), Lake Tomahawk (Wis.).

Lboratory and field investigations of the rate of NH4-N movement within freshwater lake sediment profiles and transformations within and release of NH-4N to waters from sediments were conducted on Lake Mendota, a moderately eutrophic hard water lake in southcentral Wisconsin and on Lake Tomahawk, an oligotrophic lake in northeastern Wisconsin. The results of this investigation indicate that: (a) the exchange sequence: interstitial H2O NH4-N and lake H2O NH4-N will proceed to the right and (b) while the surficial layer (0-4 cm) of sediment seems to serve as the immediate source of NH4-N to the overlying waters, as much as 16 cm of sediment can be considered as a source of NH4-N to the overlying waters. (Keeney-Wisconsin)
W73-10939

SIMPLIFIED METHOD OF OCEAN OUTFALL DIFFUSER ANALYSIS,
Montgomery (James M.) Consulting Engineers, Inc., Pasadena, Calif.
J. L. Chao, and C. M. Campuzano.
J Water Pollut Control Fed. Vol 44, No 5, p 806-812, 1972. Illus.
Identifiers: *Diffusion, Discharge (Waste water), Ocean, *Outfall, Waste water disposal.

A simplified method of calculating friction loss through a (wastewater) diffuser with a continuous lateral discharge was developed. This method is especially useful during the preliminary planning stage of an engineering project. It can be applied to diffusers with uniform, stepwise and uniformly varying discharges from their ports. Accuracy of the simplified method was verified with existing data to a satisfactory degree.--Copyright 1972, Biological Abstracts, Inc.
W73-10948

ON THE ISOLATION AND THE BACTERIOLYTIC ACTIVITY OF SOME MYXOBACTERIA ISOLATED IN WATER (SUR L'ISOLEMENT ET L'ACTIVITE BACTERIOLYTIQUE DE QUELQUES MYXOBACTERIES ISOLEES DE L'EAU),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 05A.
W73-10999

EXPERIMENTAL TREATMENT OF SURFACE WATER PURIFICATION BY LAGOONS: CHEMICAL AND MICROBIOLOGICAL ASPECTS, (TRAITEMENT EXPERIMENTAL D'EPURATION D'UNE EAU DE SURFACE PAR LANUNAGE: ASPECTS CHIMIQUES ET MICROBIOLOGIQUES),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
J. Walker, and H. Leclerc.
Water Research, Vol 7, No 5, p 707-728, May 1973. 14 fig, 6 tab, 48 ref.

Descriptors: Methodology, *Chemical properties, *Lagoons, *Water pollution, *Isolation, Microbiology, *Pollutant identification, Bioindicators, Chemical analysis, Dominant organisms, Water treatment, Rivers, Water analysis, Pseudomonas, Enteric bacteria, Dissolved oxygen, Suspended solids, Biochemical oxygen demand, Ammonia, Nitrites, Nitrates, Phosphates, Detergents, E. coli, Coliforms, Clostridium, Pathogenic bacteria, Aerobic bacteria, Anaerobic bacteria, Sulfur bacteria.
Identifiers: *Bacterial populations, Enterobacteriaceae, Aeromonas, Achromobacter, Flavobacterium, Xanthomonas, Cytophaga, Fecal pollution, Potassium permanganate consumption, Orthophosphates, Carbon chloroform extract, Organic nitrogen, Fecal streptococci.

Polluted river water was treated by lagooning in an experimental bed. The evolution of the most representative parameters of the organic and bacterial pollution has been studied in relation to the period of retention. The predominant bacterial populations have been identified and their qualitative and quantitative variations have been related to the degree of pollution. The analytical results are commented upon and the advantages of the method are stressed. (Holoman-Battelle)
W73-11000

A PRELIMINARY INVESTIGATION OF ORGANIC-INORGANIC ASSOCIATIONS IN A STAGNATING SYSTEM,
Georgia Univ., Athens. Dept. of Zoology.
J. E. Schindler, J. J. Alberts, and K. R. Honick.
Limnology and Oceanography, Vol 17, No 6, p 952-957, November 1972. 5 fig, 1 tab, 11 ref. OWRR A-029-GA (6).

Descriptors: *Sediments, *Sediment-water interfaces, *Oxidation-reduction potential, *Heavy metals, Sorption, *Hydrogen ion concentration, Filtration, Iron, Zinc, Manganese, Magnesium, Sampling, Separation techniques, Path of pollutants, Water analysis, *Georgia.
Identifiers: *Molecular weight fractionation, Transport, Membrane filters, Mobilization, Organic carbon, *Lago Pond (Geo).

Undisturbed water samples were collected from Lago Pond in Georgia using a free-fall corer fitted with a plastic insert which could be easily removed and serve as a microcosm of the sediment for use in molecular weight fractionation studies. The purpose was to examine the possibility of organic-inorganic complex formation as a mechanism for mobilization of metals during stagnation of a lake sediment system. Portions of the samples were withdrawn at various locations and at certain intervals based on redox potentials and pH values. The portions were passed through membrane filters which retained material with molecular weights of 100,000, 50,000, 10,000, 2,000, and 50. Replicate aliquots of water fractions were analyzed for organic carbon. The remainder of each water fraction was analyzed for Fe, Mg, Mn, and Zn by AA. Unfiltered samples were analyzed for organic carbon and the aforementioned metals. The concentration of each element retained in the molecular weight fractions was calculated by subtracting from the concentration in the next larger size sample. Total inorganic carbon of the aqueous phase was determined by infrared gas analysis. The results showed that (1) inorganic carbon increased during reduction; (2) organic carbon fractions were more evenly distributed by molecular weight during reduction; (3) Fe, Mg, and Mn were associated with the 10,000-50,000 molecular weight fraction during reduction; and (4) only Zn was associated with the 0-500 molecular weight fraction. It is suggested that the association of the elements studied with colloid-forming materials could impart a stability which would permit their transport to oxygen-rich, productive areas of lakes. (Little-Battelle)
W73-11004

DISSOLVED OXYGEN AND TEMPERATURE IN A STRATIFIED LAKE,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
S. A. Smith, and D. A. Bella.
Journal Water Pollution Control Federation, Vol 45, No 1, p 119-133, January 1973. 14 fig, 2 tab, 21 ref. OWRR A-003-ORE (7).

Descriptors: *Dissolved oxygen, *Water temperature, *Thermal stratification, Hypolimnion, Mixolimnion, Water properties, Water quality, Data collections, Water sampling, Epilimnion, Chemical analysis, Water analysis, *Oregon, Lakes, Hydrogen ion concentration, Alkalinity, Acidity, Suspended solids, Turbidity, Ammonia, Nitrates, Nitrites, Nitrogen, Phosphorus, Turnovers.
Identifiers: *Diel variations, *Triangle Lake (Ore), Metalimnion, Chlorophyll a, BOD5, Kjeldahl nitrogen, Orthophosphates.

Temporal and spatial variations of temperature and dissolved oxygen were measured in Triangle Lake in Oregon. The lake was relatively uniform in the horizontal direction and significantly stratified vertically. Diel dissolved oxygen variations were less than 0.5 mg/l in surface regions. Diel temperature variations resulted in a nocturnal density overturning extending to about 9 ft (3 m) in depth. Depth of summer diel overturning defined the lower boundary of the epilimnion and upper boundary of metalimnic dissolved oxygen maximum. Complete overturn did not occur during the mild winter of 1969-70, and low hypolimnetic dissolved oxygen values occurred the following summer. During summer months, desirable game fish habitats in the lake are restricted by temperature and oxygen conditions. (Holoman-Battelle)
W73-11005

OSMOTIC REVERSAL OF TEMPERATURE SENSITIVITY IN ESCHERICHIA COLI,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11028

RADIATION-RESISTANT MUTANTS OF SALMONELLA TYPHIMURIUM LT2: DEVELOPMENT AND CHARACTERIZATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
R. Davies, and A. J. Sinskey.
Journal of Bacteriology, Vol 113, No 1, p 133-144, January 1973. 5 fig, 7 tab, 46 ref.

Descriptors: Resistance, *Radiation, *Pollutant identification, Gamma rays, Cultures, Antibiotics (Pesticides), Genetics, Ultraviolet radiation, Proteins, Enzymes, Chemical analysis, Aerobic bacteria, Enteric bacteria, Coliforms, Pathogenic bacteria.
Identifiers: *Biochemical characteristics, *Mutants, Bacterial physiology, *Salmonella typhimurium LT2, Characterization, Salmonella typhimurium, Biochemical tests, Serological methods, Phage typing , Sensitivity, Survival, Culture media, RNA, DNA polymerase.

A series of repeated exposures to gamma irradiation with intervening outgrowth of survivors was used to develop radioresistant cultures of Salmonella typhimurium LT2. Stepwise increases in resistance to both ionizing and ultraviolet irradiation were obtained independently of the presence or absence of integrated P22 prophage. Single clonal isolates, representing parent and radioresistant populations, retained the general characteristics of the LT2 parent, including serological properties, phage typing, antibiotic sensitivities, mouse virulence, and most biochemical test reactions. Resistant cells were generally larger and contained 1.8 to 2.1 times more ribonucleic acid and protein than parent cells, but deoxyribonucleic acid (DNA) contents were similar. Heterogeneity in the populations with respect to release of H2S, utilization of carbon sources, and growth on minimal medium is considered to be ancillary, rather than causally related, to increased radioresistance. The resistant isolates displayed an increased ablity to reactivate gamma-irradiated P22 phage. DNA polymerase I and polynucleotide-joining enzyme activities were elevated in extracts of radioresistant cells relative to parent cells. It is suggested that the observed increases in radioresistance result from a selection of mutations leading to an increased capacity to repair DNA. (Holoman-Battelle)
W73-11029

MICROBIAL DECOMPOSITION OF PENTACHLOROPHENOL,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
E. J. Kirsch, and J. E. Etzel.
Journal Water Pollution Control Federation, Vol 45, No 2, p 359-363, February 1973. 4 tab, 9 ref.

Descriptors: *Microbial degradation, *Wood preservatives (Pesticides), *Cultures, Microorganisms, Radioactivity techniques, Bioassay, Radiochemical analysis, Biodegradation, Carbon dioxide, Carbon radioisotopes.
Identifiers: *Pentachlorophenol, *Fate of pollutants, Sodium pentachl orophenate, Bacterial populations, Substrate utilization, Degradation products, Heterotrophy, Acclimatization, Biocides, Chemical recovery, C-14, Culture media, Scintillation counting.

A soil sample was obtained from the grounds of a wood products manufacturer in Terre Haute, Indiana, who used pentachlorophenol (PCP) and added to nutrient broth in order to obtain definitive evidence of PCP biodegradation in heterogeneous cultures of microorganisms. The biodegradation of sodium pentachlorophenate was observed in both proliferating and nonproliferating mixed bacterial populations that had previously received lengthy acclimation to the biocide. Definite proof of dissimilation was obtained by measuring the release of C-1402 from radioactive sodium pentachlorophenate. The maximum yield of CO2 in a 24-hr exposure period was 68 percent in nonproliferating cultures. The rate and extent of decomposition in proliferating cultures was significant but less than found in nonproliferating cultures. Spontaneous, nonbiological decomposition of sodium pentachlorophenate was observed but did not exceed 0.1 percent in a 48-hr reaction period. (Holoman-Battelle)
W73-11048

5C. Effects of Pollution

THE INFLUENCE OF BENTHIC BARK DEPOSITS ON AQUATIC COMMUNITY AND THE QUALITY OF NATURAL WATERS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 04C.
W73-10411

MERCURY POLLUTION AND LAKE ERIE FISHES,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 05A.
W73-10444

ENHANCEMENT OF NET PRIMARY PRODUCTIVITY BY HERBIVORE GRAZING IN AQUATIC LABORATORY MICROCOSMS,
State Univ. of New York, Binghamton. Dept. of Biological Sciences.
D. C. Cooper.
Limnology and Oceanography, Vol 18, No 1, p 31-37, January 1973. 4 fig, 1 tab, 22 ref.

Descriptors: *Bioassay, *Cycling nutrients, *Fish, *Grazing, *Primary productivity, Biomass, Dominant organisms, Chlorophyta, Cyanophyta, Anabaena, Rotifers, Crustaceans, Zooplankton, Phytoplankton, Succession, Standing crops.
Identifiers: Notropis spilopterus, Spirogyra, Testudinella, Gastropus, Ceriodaphnia reticulata, Cyclops, Epischura, Aphanizomenon.

The role of herbivore grazing intensity as a factor affecting net primary productivity was investigated by introducing varying biomasses of a starved herbivore (Notropis spilopterus) into replicate autotrophic microcosms. The microcosms consisted of 15 aquaria containing 15 l of sediment from a eutrophic pond. After 20 days, the enhancement of net primary productivity in the experimental microcosms was directly related to herbivore biomass up to a certain density and inversely related above this. The relationship approximates the first derivative of a sigmoid population growth model. Enhancement of primary production under these experimental conditions appears to be due to reductions of standing crop and increased turnover rates of producer populations. The results suggest that these responses were independent of increased nutrient regeneration rates brought about by grazing. (Little-Battelle)
W73-10460

DIURNAL PERIODICITY IN THE PHYTOPLANKTON ASSEMBLAGE OF A HIGH MOUNTAIN LAKE,
Innsbruck Univ. (Austria). Inst. of Zoology.
M. M. Tilzer.
Limnology and Oceanography, Vol. 18, No 1, p 15-30, January 1973. 9 fig, 4 tab, 34 ref.

Descriptors: *Diurnal distribution, *Phytoplankton, *Photosynthesis, *Light intensity, *Migration

atterns, *Primary productivity, Lakes, Solar adiation, Algae, Anabaena, Diatoms, Sampling, Diel migration.
Identifiers: Sample preservation, Periodicity, Mountain lakes, Gymnodinium uberrimum, Desmids, Mallomonas, Synedra nana, Tetraedron, Cryptomonas ovata, Dinobryon sertularia, Synura Petersenii, Gymnodinium cf. lacustre, Peridinium Ciculiferum, Certain hirundinella, Cryptomonas Marsonii, Glenodinium.

Diurnal changes in phytoplankton stratification nd photosynthesis of high mountain lakes (Vorerer Finstertaler See) were studied at all seasons. he dominant flagellates usually ascend in the vening and at night and migrate downward with ncreasing light intensities. Maximum migratory peeds are higher than 1 m/hr and almost indepenent of cell size. The vertical stratification pattern f flagellates is the result of varying upward and ownward migrations, but the vertical stratificaons of nonmotile species depend on the turbunce of the water. Over the day the mean hotosynthesis of the entire water column varies about the same proportions as the input of light nergy. At a given depth algae seem to be adapted the daily mean value of light intensity. Near the ke surface, around noon (1000-1400 hours), hotosynthesis is considerably reduced due to ownward migration, light saturation, and light inibition--all caused by high light intensities--but at reater depths the utilization of light energy requently is increased. During low light periods arly morning, evening) suboptimal light intensies in deeper layers of the lake cannot be utilized effectively. By phototactic verticle migrations, he diurnal shifts of light energy utilization can be artly compensated. (Little-Bettelle)
W73-10461

MARINA DEL REY: A STUDY OF ENVIRONMENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 05B.
W73-10465

AN ANALYSIS OF FACTORS GOVERNING PRODUCTIVITY IN LAKES AND RESERVOIRS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
M. Brylinsky, and K. H. Mann.
Limnology and Oceanography, Vol. 18, No. 1, p 1-14, January 1973. 11 fig, 5 tab, 28 ref.

Descriptors: *Primary productivity, *Secondary productivity, *Limiting factors, *Nutrients, *Lake morphology, *Solar radiation, *Statistical methods, Hydrogen ion concentration, Conductivity, Lakes, Reservoirs, Water analysis, Biomass, Chlorophyll, Energy transfer, Phytoplankton, Zooplankton, Benthos, Depth, Water temperature, Nitrates, Phosphates, Alkalinity, Calcium, Dissolved solids, Phosphorus, Nitrogen, Regression analysis, Photosynthesis, Data collections, Water quality.
Identifiers: Data interpretation, *Chlorophyll a.

Data collected as part of the International Biological Program from 43 lakes and 12 reservoirs, distributed from the tropics to the arctic, were subjected to statistical analysis to establish which factors are important in controlling production and how they are related. In the whole body of data, variables related to solar energy input have a greater influence on production than variables related to nutrient concentration; in lakes within a narrow range of latitude, nutrient-related variables assume greater importance. Morphological factors have litte influence on productivity per unit area in either case. Chlorophyll a concentration is a good indicator of nutrient conditions and when combined with an energy-related variable constitutes a good estimator of primary production. (Little-Battelle)
W73-10475

UPTAKE AND BIOTRANSFORMATION OF PHENYLMERCURIC ACETATE BY AQUATIC ORGANISMS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05B.
W73-10477

KINETIC STUDY OF PHOSPHATE REACTION WITH ALUMINUM OXIDE AND KALONITE,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 05B.
W73-10479

SEASONAL FLUCTUATIONS OF IONIC COPPER IN KNIGHTS POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-10487

THE VALIDITY OF THE APPLICATION OF SIMPLE KINETIC ANALYSIS TO HETEROGENEOUS MICROBIAL POPULATIONS,
Southampton Univ. (England). Dept. of Oceanography.
P. J. LeB. Williams.
Limnology and Oceanography, Vol 18, No 1, p 159-165, January 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Mathematical models, *Aquatic bacteria, *Growth rates, *Metabolism, *Nutrients, Population, Absorption.
Identifiers: Data interpretation, Substrate utilization, Species diversity.

It is shown by use of a mathematical model that heterogeneous populations do not adhere to the Michaelis and Menten equation; at low substrate concentration, observed rates are higher than predicted ones. The discrepancy between observed and predicted values increases as the population becomes more diverse. If kinetic analysis based on the Michaelis and Menten equation is used to determine the rate of turnover of substrates in natural waters, the rate may be underestimated unless measurements are made at very low added substrate concentration. (Little-Battelle)
W73-10489

METHODS OF ESTIMATING THE HALF-LIFE OF BIOLOGICAL ACTIVITY OF TOXIC CHEMICALS IN WATER,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking.
Investigations in Fish Control Report No 46, July 1972. 9 p, 2 fig, 3 tab, 5 ref.

Descriptors: *Antimycin A, *Pescicides, *Bioassay, *Water pollution effects, *Pesticide toxicity, *Methodology, Fish control agents, Rainbow trout, Channel catfish, Pesticide kinetics, Freshwater fish, Sunfishes, Hydrogen ion concentration, Hardness (Water), Mortality.
Identifiers: Biological activity, Half-life, Green sunfish, Goldfish, Median tolerance limit, Carassius auratus, Ictalurus punctatus, Lepomis cyanellus, Salmo gairdneri.

In the absence of analytical methods, the half-life of biological activity of a chemical (the time required to decrease its toxic activity by one-half) can be extimated by bioassays. The methods presented require the determination of LC50 values (concentration producing 50 percent mortality) for organisms in aged solutions containing unknown residual concentrations. The half-life of biological activity is determined by plotting (1) the percent concentrations remaining in aged solutions or (2) the deactivation indices against aging time on cyclic semilogarithmic graph paper. By the first method, a 5-day half-life for antimycin, a fish toxicant, was determined using resistant channel catfish (Ictalurus punctatus) and goldfish (Carassius auratus) and for sensitive green sunfish (Lepomis cyanellus) and rainbow trout (Salmo gairdneri) in soft water at pH 7.5. The second method, using only rainbow trout, also estimated a 5-day half-life for antimycin in soft water at pH 7.5. These methods could be used also to determine the half-life of antimycin at different pH's, temperatures, and light intensities, the factors thought to influence the toxicant's efficacy. The methods are not limited to fish and fish toxicants. (Holoman-Battelle)
W73-10495

RESIDUES OF MS-222 IN NORTHERN PIKE, MUSKELLUNGE, AND WALLEYE,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 05A.
W73-10496

ULTRASTRUCTURE OF STAPHYLOCOCCUS EPIDERMIDIS AFTER FREEZE-ETCHING AND THIN SECTIONING,
McGill Univ., Montreal (Quebec). Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-10500

STUDIES OF THE CELL ENVELOPE OF VIBRIO PARAHAEMOLYTICUS,
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-10501

DYNAMICS OF A SALT OF (2,4--DICHLOROPHENOXY) ACETIC ACID IN FISH, WATER, AND HYDROSOL,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
D. P. Schultz.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 186-192, March/April 1973. 8 tab, 9 ref.

Descriptors: *Pesticide toxicity, Water analysis, *Bioassay, *Hydrogen ion concentration, *Radioactivity techniques, Water temperature, Freshwater fish, Toxicity, 2 4-D, Pesticide residues, Absorption, Gas chromatography, Animal metabolism, Fish eggs.
Identifiers: *DMA-2 4-D, Tissue, Bioaccumulation, Sample preparation, *Gas liquid chromatography, Channel catfish, Lepomis macrochirus, Largemouth bass, Fathead minnow, Blood, Brain, Excretion, Scintillation counting, Gills, Bile, Liver, Kidney, Muscle,Fat, Pyloric caeca, Testes, Hydrosol, Biological magnification.

The uptake, distribution, and dissipation of C-14-labeled dimethylamine salt of (2,4-dichlorophenoxy)acetic acid (DMA-2,4-D) from water by three species of fish was studied concurrently with the dissipation of DMA-2,4-D from water and hydrosol. Fish were exposed to 0.5, 1.0, or 2.0 mg/l. concentrations of herbicide for up to 84 days. Radioactive residues of 2,4-D were determined by radiometric procedures in eight or more tissues and organs. Residues of 2,4-D were determined in muscle and whole-body extracts by gas chromatography. Radioactive residues were found in all fish tissues and organs analyzed, but actual 2,4-D content was negligible in muscle, indicating that most of the C-14-residue was a metabolite (s) of 2,4-D. Residues of 2,4-D declined in water to

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less than 0.1 mg/1. after 35 days and in hydrosol to less than 0.1 mg/kg after 14 days. (Little-Battelle)
W73-10507

BIOLOGICAL NITROGEN FIXATION IN THE GREAT LAKES,
Wisconsin Univ., Madison, Dept. of Biochemistry.
T. H. Mague, and R. H. Burris.
BioScience, Vol 23, No 4, p 236-239, April 1973. 3 fig, 3 tab, 18 ref.

Descriptors: *Nitrogen fixation, *Great Lakes, *Phytoplankton, Water sampling, Oligotrophy, *Eutrophication, Nitrogen cycle, Cycling nutrients, Cyanophyta, Lake Erie, Lake Huron, Lake Superior, Lake Michigan, Methodology, Diatoms, Chrysophyta, Anabaena, Dinoflagellates, Pyrrophyta, Chlorophyta.
Identifiers: Green Bay, *Acetylene reduction, Flame ionization gas chromatography, Sample preparation, Asterionella formosa, Fragilaria, Tabellaria, Oscillatoria, Aphanizomenon flos-aquae, Microcystis aeruginosa, Lyngbya, Pediastrum, Ceratium hirundinella, Van Dorn bottles, Ethylene.

The acetylene reduction technique was used for assessing potential N2-fixation in lake water samples. Water samples from Green Bay and Lakes Erie, Superior, Huron and Michigan were passed through a 64-micron silk plankton netting to concentrate the phytoplankton prior to testing. One-ml samples of the concentrate were transferred to glass serum bottles to which acetylene was added directly without other modification of the atmosphere. The bottles were incubated for approximately 30 min; acetylene reduction was terminated by the addition of 5 N H2SO4 and the serum stoppers were sealed against possible leakage. Four replicate bottles were prepared from each sampling site, and one was immediately inactivated with acid to serve as a control. The quantity of ethylene was determined by flame ionization after gas chromatographic separation from acetylene on a 1.2 m x 2 mm column of Poropak N run at 75 degrees C. Acetylene reduction by the phytoplankton in Lake Superior, the western end of Lake Huron, and eastern Lake Michigan was barely detectable in September of 1970, but in southern Green Bay of Lake Michigan and the shallow basin of Lake Erie it was comparable in rate to that in eutrophic Wisconsin lakes. Acetylene reduction activity in Green Bay was low in the mouth of the main tributary, increased to a maximum 5-15 km northeast into the bay, and then decreased farther northeast. Vigorous acetylene reduction was always associated with an abundance of heterocystous blue-green algae. (Holoman-Battelle)
W73-10511

EFFECTS OF IRON ON ACTIVATED SLUDGE TREATMENT,
Marquette Univ., Milwaukee, Wis.
For primary bibliographic entry see Field 05D.
W73-10512

PRODUCTION OF THE GIANT KELP, MACROCYSTIS, ESTIMATED BY IN SITU INCORPORATION OF C-14 IN POLYENTHYLENE BAGS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 05B.
W73-10516

A FIELD FIXATION TECHNIQUE FOR DISSOLVED PHOSPHATE IN LAKE WATER,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. Shapiro.
Limnology and Oceanography, Vol 18, No 1, p 143-145, January 1973. 4 tab, 2 ref.

Descriptors: *On-site investigations, *Solvent extractions, *Phosphates, Spectrophotometry, Pollutant identification, Chemical analysis, Lakes, Chelation, Chemical reactions, Color reactions.
Identifiers: *Sample preservation, *Orthophosphates, Accuracy, Natural waters, *Sample storage, Sample preparation, Isobutanol, Phosphomolybdic acid.

Natural water samples containing dissolved orthophosphate may be fixed in the field and analyzed for orthophosphate in the laboratory as much as 2 weeks later. This fixation method involves adding reagents to the water sample and extracting the phosphomolybdic acid formed into isobutanol within 30 sec. In the laboratory the phosphomolybdate in isobutanol was washed with dilute HCl, made to volume, and stannous chloride was added to reduce the compound to its blue form. The color was read in a spectrophotometer and compared with standards. Storage of the samples for 7 days results in values that are at most 15 percent different from the initial values; after 2 weeks the greatest deviation was less than 20 percent. With this fixation method, it is not necessary to keep the extract in the dark. No special preservation methods are necessary either for the water samples or the extracts, and instead of carrying water samples back from the field one need bring back only small vials of extract. (Holoman-Battelle)
W73-10519

THE UPTAKE, STORAGE, AND RELEASE OF DIELDRIN AND SOME EFFECTS OF ITS RELEASE IN THE FISH, CICHLASOMA BIMACULATUM (LINNAEUS),
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05B.
W73-10536

A STUDY OF THE INFLUENCE OF CALCIUM ON THE EFFECTS OF DDT ON FISHES,
Mississippi Univ., University.
L. R. Keffler.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-1275. Ph D Dissertation, 1972. 131 p.

Descriptors: *Calcium, *DDT, Water pollution effects, *Bioassay, *Poisons, *Pesticide toxicity, Freshwater fish, Chlorinated hydrocarbon pesticides, Laboratory tests, Insecticides.
Identifiers: *Goldfish, *Golden shiner, Carassius auratus, Notemigonus crysoleucas.

Investigations were undertaken dealing with a likelihood of a relationship between calcium deficiency and DDT poisoning. Goldfish, Carassius auratus, and golden shiners, Notemigonus crysoleucas, were tested using sixteen different combinations of calcium and DDT concentrations. Because of the possibility of influence by the accompanying anion, three different salts were used as sources of the calcium ion. A series of different experimental tests indicated good probability of the suspected relationship between calcium and DDT. Fishes poisoned with DDT in the laboratory were observed to give evidence of all the symptoms of calcium deficiency. Increasing the concentration of calcium ions in the water from 0 to 200 ppm seemed to alleviate the DDT poisoning symptoms of fishes and decrease the death rate, when the DDT concentration did not exceed 20 ppb. Goldfish were more responsive to treatment than were golden shiners. Of the calcium salts used calcium chloride was more effective than either calcium carbonate or calcium gluconate. Two possible conclusions to be drawn are that DDT is not simply a neurotoxin, and that the calcium differences between hard and soft water may be sufficient to give a survival advantage to fished in the hard water regions of the country. (Holoman-Battelle)
W73-10537

THE CARBON CYCLE IN THE EPILIMNION OF TWO MICHIGAN LAKES,
Michigan State Univ., East Lansing.
M. C. Miller.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-5446. Ph D Dissertation, 1972. 233 p.

Descriptors: *Biological communities, *Cycling nutrients, *Essential nutrients, *Carbon cycle, *Epilimnion, Water pollution sources, Metabolism, Benthos, Model studies, Lakes, Primary productivity, Nutrient requirements, Standing crops, Sedimentation rates, Michigan, Degradation (Decomposition), Limiting factors, Absorption.
Identifiers: *Dissolved organic carbon, *Particulate organic carbon, Substrate utilization, Heterotrophic nutrition, Oxygen depletion, Glucose, Acetates, Glycolates.

The planktonic communities of two contrasting lakes were examined to quantify budgets and dynamics of dissolved and particulate organic carbon. Rates of primary production, extracellular secretion, particulate carbon sedimentation, input of humic material, heterotrophic uptake of glucose, acetate and glycolate, and oxygen depletion were determined in relation to simultaneous measurements of standing crops of algal carbon, total dissolved, and particulate organic carbon and humic organic carbon. Benthic metabolism affected the planktonic heterotrophs more in the shallower lake. In general, the heterotrophic uptake of small organic molecules varied directly with planktonic algal production and secretion. The size of the particulate organic carbon pool was proportional to the rates of primary production. The size of the dissolved organic carbon pool was apparently related inversely to the amounts of limiting nutrients. In the deeper of the two lakes the inputs of dissolved organic carbon into the surface waters ranked by importance were: autolysis and algal cell rupture, runoff in rainwater, secretion by and decomposition of aquatic plants, phytoplankton secretion, and particulate organic carbon decomposition in the water column. Rates of transfer and organic carbon pools are discussed and a model integrating these results is presented. (Holoman-Battelle)
W73-10538

THE EFFECT OF CALCIUM ON GROWTH AND MORPHOGENESIS OF CHLORELLA, GOLENKINIA, AND SCENEDESMUS,
Washington State Univ., Pullman.
H. Rahimian.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-73. Ph D Dissertation, 1972. 89 p.

Descriptors: Water pollution effects, *Calcium, *Plant morphology, *Aquatic algae, *Plant physiology, Plant growth, Strontium, Aquatic plants, Alkaline earth metals, Cultures, Enzymes, Bioassay, Chelation, Limiting factors.
Identifiers: Ethyleneglycol bisaminoethylether tetraacetic acid, Barium, *Chlorella pyrenoidosa, *Scenedesmus obliquus, *Golenkinia minutissima, Culturing techniques, Enzyme activation, Uridine diphosphoglucose pyrophosphorylase, Uridine diphosphoglucose fructose transglucosylase.

Morphogenetic effects of calcium on Chlorella pyrenoidosa, Scenedesmus obliquus, and Golenkinia minutissima strains 929 and 930 were studied, as were the effects of strontium, barium, and ethyleneglycol bisaminoethylether tetraacetic acid (EGTA) on Scenedesmus. Inoculated cells were starved in a calcium-free medium for one week before the time of inoculation. Organisms were grown under controlled conditions at a temperature of about 20 C and illuminated with an intensity of 350 ft-c from cool-white fluorescent lamps regulated to provide 16 hours of light and 8 hours of darkness. Cultures were aerated with a mixture of 3 percent CO2 in air. Growth was measured in

terms of increase in the cell population and increase in the amount of fresh and dry matter. The results were as follows: (1) Calcium was shown to be necessary for production of the maximum number of cells in each species studied. (2) In the presence of Ca the cultures yielded a greater weight production and greater dry weight per gram of fresh weight than in the absence of Ca. (3) In the presence of Ca the starch content of cells was greater. (4) The K/Na ratio in the cells was greater in the presence of Ca. (5) The number of cells produced was significantly decreased when Sr or Ba was substituted. (6) Calcium played a role in cell morphology. (7) Calcium was shown to be necessary for colony formation in Scenedesmus. (8) Cell size was found to be inversely proportional to the number of cell production. (9) Seta formation in Golenkinia was shown to require Ca. (10) In the presence of higher than 0.6 mM of EGTA, a specific chelating agent for Ca, the algal cells died. (11) It is hypothesized that Ca is required for activating enzymes involved in wall formation and cell division as well as for maintaining membrane integrity. This has already been established for uridine diphosphoglucose pyrophosphorylase and uridine diphosphoglucose fructose transglycosylase which function in wall formation. (Holoman-Battelle)
W73-10540

POPULATION DYNAMICS AND THE EFFECT OF INORGANIC IONS ON CERTAIN MICROCRUSTACEA,
Cincinnati Univ., Ohio.
C. B. Carpenter.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor Mich., 48106, Order No. 73-3824. Ph D Dissertation, 1972. 108 p.

Descriptors: *Crustaceans, *Zooplankton, *Bioassay, *Sodium compounds, *Potassium compounds, Environmental effects, *Cations, Invertebrates, Carbonates, Ponds, Waterfleas, Copepods, Laboratory tests, Freshwater, Water sampling, Water temperature, Dissolved oxygen, Carbon dioxide, Light intensity, Air temperature, Allalinity, Hydrogen ion concentration, Sodium chloride.
Identifiers: Population density, Data interpretation, Median tolerance limit, Chemical indicators, Methyl orange, Phenophthalein, Nauplii, Daphnia pulex, Daphnia magna, Ceriodaphnia reticulata, Bosmina longirostris, Diaptomus spp, Daphnia spp, Potassium chloride, Sodium bicarbonate, Potassium bicarbonate, Sodium hydroxide, Potassium hydroxide, Sodium carbonate, Potassium carbonate, Factorial analysis.

Some of the primary and most important microcrustacean species were used in a field study of freshwater ponds with reference to seasonal changes in population density and effects of environmental conditions. Samples taken from two fresh-water ponds were analyzed for numbers of microcrustacea per liter of pond water, pH, water temperature, air temperature, dissolved oxygen, total alkalinity (methyl orange), carbonate alkalinity (phenolphtalein), bottom dissolved oxygen, free carbon dioxide and light intensity at the surface of the pond. The representative microcrustacea were Bosmina longirostris, Ceriodaphnia reticulata, Daphnia spp., Diaptomus spp., and copepoda nauplius larvae of unidentified species. Because of high negative correlations with the alakalinity parameter laboratory studies were executed to determine the effects of the component ions on the organisms in a controlled testing regime. LD-50 values were determined for nine clones (6 Daphnia magna, 2 Daphnia pulex, and 1 Ceriodaphnia reticulata) when they were exposed to NaCl, KCl, NaHCO3, KHCO3, NaOH, KOH, Na2CO3 and K2CO3. Factorial analysis of the data was used to determine the extent of each main cation and anion effect and any interaction effects. On the basis of the factorial analysis, the negative correlations between the organisms and the alkalinity parameters are valid with respect to information from both lab tests and field data. (Holoman-Battelle)
W73-10542

THE RELATIONSHIP BETWEEN IONS AND CILIARY ACTIVITY IN THE GILL OF MYTILUS EDULIS,
Fordham University, Bronx, N.Y.
B. H. D. Felton.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor Mich., 48106, Order No. 73-1475. Ph D Dissertation, 1972. 198 p.

Descriptors: *Cations, *Anions, *Inhibition, Water pollution effects, *Animal physiology, Halides, Heavy metals, Alkaline earth metals, Alkali metals, Clams, Sodium, Potassium, Calcium, Magnesium, Chlorides, Manganese, Inhibitors, Mollusks, Invertebrates.
Identifiers: *Mytilus edulis, *Ciliary activity, Excitation, Tetrodotoxin, Lithium, Barium, 5-Hydroxytryptamine, Calcium electrode, Ion selective electrodes, Gills, Caffeine, Macroinvertebrates, Ca-145, Calcium radioisotopes, Scintillation counting, Choline.

Previous authors have reported that ions stiumlate or inhibit ciliary activity in Mytilus edulis. This investigation attempts to clarify the relationship between the major ions in artificial sea water (ASW) of normal balance to the beating of lateral cilia and other types of cilia in the excised gill of Mytilus edulis. ASW was used to perfuse a ganglion-nerve gill preparation. The rate of ciliary beating was determined by timing the metachronal waves with a stroboscope. The effect of Na, K, Ca, Mg and C1, on the basal beat frequency and on the cilioexcitatory effect of 5-hydroxytrptamine (5-HT), KC1, and caffeine was determined. Li, Ba, Mn were studied for the same effects. By replacing the ions in ASW of normal balance with substitutes, such as other ions, choline, gluconate salts, or sorbitol, it was possible to detect the influence of the major ions. Tetrodotoxin (TTX) 0.000016 M does not inhibit ciliary activity of the gill in ASW. In a 1:1 choline/Na ASW, TTX 3 microM (1 microgram/ml) inhibits lateral cilia and blocks the cilioexcitatory effect of KC1. Li 42 mM is cilioinhibitory and also blocks excitation by 5-HT. Nerve stimulation with electrical current is partially blocked by Li. The addition of 5-HT to gills in ASW causes a rapid efflux of Ca from the gill tissue followed by an influx of Ca. The Ca efflux and influx in gill tissue was measured with a Ca selective electrode and also with Ca-45 in a scintillation counter. Caffeine was cilioexcitatory in this investigation, and was tested by the same methods described for 5-HT. When Mn was substituted for Ca in the presence of TTX in 1:1 choline/Na ASW, cilioexcitation by 5-HT and caffeine were not blocked. When Ba or Mn is substituted for Ca in ASW, the basal beat frequency is elevated. The effect of excess ions on the basal beat frequency and on the cilioexcitatory effect of 5-HT was also studied. 5-HT, a known cilioexcitatory agent and metabolic activator in Mytilus gill, has now been shown to cause a change in the membrane permeability of gill tissue to Ca. 5-HT causes a rapid efflux followed by an influx of Ca from internal stores of the ion in gill tissue.This indicates that the chain of events initiated by 5-HT in gill tissue of Mytilus edulis involves Ca release, increased glycolysis, and the formation of ATP which results in cilioexcitation. (Holoman-Batelle)
W73-10543

FRESHWATER ALGAE FROM THE ITASCA STATE PARK MINNESOTA, IV. CYANOPHTA, RHODOPHYTA, CHLOROMONADOPHYCEAE, AND CRYPTOPHYCEAE,
Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 05A.
W73-10544

DIATOMS IN ALKALINE, SALINE LAKES: ECOLOGY AND GEOCHEMICAL IMPLICATIONS,
Duke Univ., Durham, N.C. Dept. of Zoology.
R. E. Hecky, and P. Kilham.
Limnology and Oceanography, Vol 18, No 1, p 53-71, January 1973. 7 fig, 4 tab, 52 ref.

Descriptors: *Diatoms, *Saline lakes, *Alkalinity, *Dominant organisms, *Lake sediments, Chrysophyta, Aquatic algae, Geochemistry, Limnology, Water chemistry, Water sampling, Bottom sampling, Biological communities, Plant populations, Shallow water, Meromixis, On-site data collections, Hydrogen ion concentration, Calcium, Chlorides, Magnesium, Phosphates, Silica, Conductivity, Sodium, Potassium, Sulfates, Fluorides, Water analysis, Chemical analysis, Bicarbonates, Carbonates, Benthic flora, Ecology, Systematics, Classification.
Identifiers: *East Africa, Light microscopy, Sample preservation, Sample preparation, Silicon, Atomic absorption spectrophotometry, Ekman dredge, Cyclotella meneghiniana, Coscinodiscus rudolfi, Navicula elkab, Nitzschia frustulum, Nitzschia sigma, Anomoeoneis sphaerophora, Rhopalodia gibberula, Nitzschia hungarica, Fragilaria pinnata, Eunotia, Stauroneis, Achnanthes exigua, Achnanthes lanceolata, Amphora coffeaeformis, Amphora ovalis.

Six diatoms achieved dominance in 26 alkaline, saline lakes in East Africa. There is a pronounced tendency for these species to replace each other as alkalinity increases. Cyclotella meneghiniana is usually dominant in less concentrated lakes and Nitzschia frustulum is favored as the alkalinity exceeds 80 meq/liter. Coscinodiscus rudolfi and Navicula elkab are occasionally dominant at intermediate alkalinities. Navicula elkab is usually subdominant when N. frustulum is dominant. Most of these species when dominant are considered functionally planktonic in these waters. The presence of the cyanophyte Oscillatoria (Arthrospira) platensis in bloom seems to be a prerequisite for N. elkab and N. frustulum to enter the plankton. There is some evidence that the anionic composition of these lakes may be selective for some of the benthonic species. Geochemical data indicate that the production and preservation of diatom frustules appear to control silica concentrations in the waters. Relatively poor correlations were observed between sodium and silica and between pH and silica. These data have important implications for theoretical models of geochemical evolution in closed basins. Little or no dissolution of fossil diatom frustules was observed in the sediments of these highly alkaline, high pH waters. (Holoman-Battelle)
W73-10545

STUDY OF THE CONTAMINATION OF ARENICOLA MARINA L. BY COBALT-60, (ETUDE DE LA CONTAMINATION D'ARENICOLA MARINA L. (ANNELIDE POLYCHETE) PAR LM COBALT-60),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Service de Recherches Toxicologiques et Ecologiques.
C. Triquet.
Comptes Rendus De L'Academie des Sciences, Vol 276, Series D, No 4, p 645-648, January 22, 1973. 3 fig, 12 ref.

Descriptors: *Cobalt, Water pollution effects, *Radioactivity, *Annelids, *Worms, *Vectors (Biological), Seawater, Sediments, Organic matter, Animal physiology, Digestion.
Identifiers: *Polychaetes, *Arenicola marina, Contaminant concentrations.

Populations of the marine polychaete Arenicola marina were contaminated with cobalt-60 from wastes of the nuclear power industry. Three vectors were suggested: water, substrate, sediments, and organic material in the sediments (Arenicola is a suspension feeder). Such organisms concentrate

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cobalt-60 to a high degree in their blood. The method of contamination was studied experimentally in water contaminated with chloride of cobalt-60. Results of the contaminant conentration studies indicated water passing over the sediments as the vector. The concentration of radioactivity at the digestive tube levels in the worms indicated that contaminants are concentrated in the organic material in sediments and then ingested. A marked increase in level of radioactivity was noted. (Ensign-PAI)
W73-10551

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 05B.
W73-10555

THE LIMNOLOGY OF STOCKBRIDGE BOWL, STOCKBRIDGE, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
S. D. Ludlam, K. S. Hutchison, and G. E. Henderson.
Available from the National Technical Information Service as PB-221 021, $3.00 in paper copy, $0.95 in microfiche. Massachusetts Water Resources Research Center Completion Report FY-73-4, (1973). 63 p, 4 fig, 16 tab, 38 ref. OWRR A-044 MASS (1).

Descriptors: *Eutrophication, *Paleolimnology, *Calcium, *Silica, *Aquatic productivity, Dissolved oxygen, Sedimentation rates, Lake sediments, Water temperature, Phytoplankton, Algae, Diatoms, Aquatic plants, Lake morphology, *Massachusetts.
Identifiers: New England Lakes, Berkshire Lakes, *Stockbridge Bowl (Mass).

Stockbridge Bowl is a eutrophic hard-water lake. Mean annual gross primary productivity was ca. 4.9 g C per square meter per day. Microcoleus lyngbyaceus dominated the phytoplankton through much of the year and formed a productive metalimnetic plate during summer stratification. Silica never became limiting to diatom growth, despite a spring diatom pulse. Silica, calcium and magnesium all showed inverse clinograde distributions during periods of stratification and values in the hypolimnion began to rise before anoxia. Fall in Ca-Mg hardness and delayed rise in Si values in the summer epilimnion were caused by precipitation of marl and uptake of Si in the littoral zone. Surficial sediments were laminated and the laminae were approximately annual. Analysis of diatom communities in the sediment revealed rapid increase in productivity over the past quarter century associated with development of the watershed.
W73-10561

THE ECONOMIC EFFECTS OF PAWTUCKAWAY STATE PARK: V. EFFECT OF PARK USE ON ENVIRONMENTAL QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
C. T. K. Ching, and G. E. Frick.
Available from the National Technical Information Service as PB-221 022, $3.00 in paper copy, $0.95 in microfiche. New Hampshire Water Resources Research Center, Durham, Research Report No 8, December 1972. 53 p, 10 fig, 18 tab, 11 ref. OWRR A-026-NH (1). 14-31-0001-3229.

Descriptors: *Environmental effects, *Water quality standards, *Parks, Recreational facilities, Coliforms, Water analysis, Property values, Water utilization, *New Hampshire, Sampling, Regression analysis.
Identifiers: *Pawtuckaway State Park (N.H.), *Nottingham, Analysis of variance.

The purpose was to determine the effect of Pawtuckaway State Park on the quality of the immediate environment. During the summer of 1971, an intensive study was made of (1) lake water quality as affected by park usage, and (2) the attitudes of private water-oriented landowners toward the park. First, physical measurements of water quality were made and twelve water quality indices were determined by a sampling process. Measurements indicated that the levels of eleven water quality indices were within acceptable bounds for recreational use. Coliform count, the twelfth indicator, occasionally exceeded State limits, but the mean value of the beach area was below the State limit. Neither climate, attendance, weekend use (as high as 8,000 people), nor time were significant determinants of the coliform level. Second, a survey of shoreline residents was conducted to determine their attitudes about the impact of the park on the environmental quality of the surrounding area. This survey indicated that the majority of the 90 landowners interviewed held favorable attitudes toward the park, including an opinion that the park improved their property values. Both the water quality analysis and the attitudinal survey indicated that the establishment of Pawtuckaway State Park has not had an adverse effect on the quality of the environment.
W73-10562

POLLUTION OF THE MARINE ENVIRONMENT AND THE EFFECTS THEREFROM: THE CASE FOR STRICTER ENFORCEMENT,
York Univ., Downsview (Ontario). Faculty of Environmental Studies.
L. M. Edelstein, and M. S. Wei.
In: Oceans Ontario. Technical Sessions. April 22, 1972. James Allister Mac Innes Foundation, Toronto, Ontario, Canada, p 53-81, (1972). 18 ref.

Descriptors: *Canada, *Coasts, *Water pollution control, *Oil, Chemicals, Radioactive wastes, *Water pollution effects, Toxicity, Aquatic life, Food chain, Biological oxygen demand, Balance of nature, Oil spills, Cleaning, Burning, Chemicals, Dispersion, Skimming, *Legislation.

The difficulties faced by Canada, having the longest coastline in the world are unique and she is forced to come to terms with the many pollution problems of her seas and coasts. The effects of crude oils, noxious chemicals, and radioactive wastes on the ocean environment are discussed, including toxicity to marine life, assimilation into the food chain, high BOD, and upset of the ecological balance. The immediate and long-term effects of oil spills are stressed; cleanup techniques such as burning, skimming, sinking, and chemical dispersal are described. Canada's position as a coastal state rather than a shipping state limits her effectiveness internationally. Canadian legislation concerning pollution control is discussed. (Ensign-PAI)
W73-10581

AN ECOLOGICAL STUDY OF THREE FRESH WATER PONDS OF HYDERABAD-INDIA: II. THE ENVIRONMENT,
Osmania Univ., Hyderabad (India). Hydrobiology Lab.
V. S. Rao.
Hydrobiologia. Vol 39, No 3, p 351-372, 1972.
Identifiers: *Bacteria, Ecological studies, Environment, *India (Hyderabad), *Phytoplankton, Ponds, Water pollution effects.

The fluctuation of pH, Ca and bicarbonate contents of water were influenced by dissolved CO2. Invariably the concentration of Ca and bicarbonate were complementary to each other, but on certain occasions Na and Fe also behaved like Ca towards bicarbonate. The accumulation of soluble organic matter in water depended largely on the density of phytoplankton population and also on Mg and the Ca/Mg ratio. The concentration of nitrate increased in these waters either after the early rains or towards the end of monsoon season. Possibly it depended on the nature of the catchment area and on the intensity of bacterial activity. The salinity and total solid contents of water varied together. Waters sustained more total solids when the pH was around 7.8. The % sodium and % Cl + NO3 fluctuated directly with salinity and apparently indicated pollution of animal origin. Na and chlorides showed a direct relationship. (See also W72-01363)--Copyright 1972, Biological Abstracts, Inc.
W73-10625

SEASONAL CHANGES OF THE NUMBER OF NITROGEN CYCLE BACTERIA IN BOTTOM SEDIMENTS OF A POOL,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
E. Fischer.
Pol Arch Hydrobiol. Vol 19, No 1, p 37-52. 1972. Illus.
Identifiers: Bacteria, *Bottom sediments, *Nitrogen bacteria, Pools, *Seasonal, Sediments.

The seasonal changes of the total number of bacteria were investigated as well as those of bacterial groups taking part in the conversions of N compounds in the surface layers of bottom sediments in a pool of the Kampinos Forest. All groups of bacteria respond to factors affecting the whole community, but in different ways. Their densities in particular seasons of the year are different.--Copyright 1973, Biological Abstracts, Inc.
W73-10641

THE PHYTOPLANKTON OF LAKE OVRE HEIMDALSVATN, CENTRAL SOUTH NORWAY, 1969-70,
Norwegian Inst. for Water Research, Oslo.
Pal. Brettum.
Identifiers: Blooms, Chlorophyceae, Chrysophyceae, Cryptophyceae, Lakes, Mountain lakes, *Norway, *Phytoplankton, Spring, *Lake Ovre Heimdalsvatn.

The quantitative and qualitative composition of phytoplankton in Lake Ovre Heimdalsvatn, a high mountain lake in Jotumheimen, was studied from July 1969 to Sept. 1970, with 18 vertical sampling series at 2 stations. Species within the classes Chrysophyceae, Chlorophyceae and Cryptophyceae predominated. The algal composition and total phytoplankton volume were very similar at the 2 stations throughout the year. The highest values of total volume, about 600 x 1,000,000 micro 3/1, occurred during the spring bloom.--Copyright 1973, Biological Abstracts, Inc.
W73-10644

THE ROLE OF FLOOD FLOWS IN NUTRIENT SUPPLY AND REMOVAL AS A FACTOR IN THE EUTROPHICATION OF THE CONNECTICUT RIVER,
New Hampshire Univ., Durham.
C. Barksdale.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center, Publication No. 25, 1973. Appendix D, 19 p, 5 tab, 44 ref. OWRR C-2169 (No. 3377) (1).

Descriptors: *Flood flow, *Nutrients, *Eutrophication, Low flow, Urban runoff, Environmental effects, Pollution, *Connecticut River, *Diversion, *Inter-basin transfers.
Identifiers: Long Island Sound.

A survey of available literature to determine the role of flood flows in nutrient supply and removal in the Connecticut River Basin and their effect on the eutrophication of the river and the Long Island Sound is presented. The literature and data from

the U.S. Public Health Department permit the construction of discharge versus nutrient concentration graphs at two points on the Connecticut River, but do not enable definitive conclusions to be made with regard to eutrophication. The basic findings of the survey are that (1) flood flows increase the nutrient loads in the Connecticut River as they tend to flush out nutrients trapped during low flows; (2) urban and suburban areas are the greatest source of nutrients in the Connecticut River Basin; (3) impoundments along the river have a significant effect on the release of nutrients as the dams tend to trap materials having a deleterious effect on the Connecticut River water especially during low flow periods; and (4) further study is necessary to assess the degree of eutrophication of the River and Long Island Sound caused by flood flows. (See also W73-10726). (Elfers - North Carolina).
W73-10730

A STUDY OF THE PROBABLE EFFECTS OF THE DIVERSION OF FLOOD WATERS UPON THE ECOLOGY OF THE CONNECTICUT RIVER ESTUARY,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 02L.
W73-10732

TRACE ELEMENT ANALYSES OF COLUMBIA RIVER WATER AND PHYTOPLANKTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05A.
W73-10806

ZOOLOGICAL AND WILDLIFE REVIEWS: THE CONSERVATION OF FISH,
Huntingdon Research Centre (England). Dept. of Pesticides Science.
L. E. Mawdesley-Thomas, and W. D. Fraser.
Br Vet J. Vol 128, No 7, p 337-346. 1972. Illus.
Identifiers: *Fish conservation, *Pesticides, Pollution, Reviews, Wildlife, Zoological studies, *Industrial wastes, Water pollution effects.

The problem of water pollution with industrial toxicants and pesticides and its effect on the conservation of fish is discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-10807

A COMPARISON OF MICROARTHROPOD POPULATIONS IN SEWAGE-EXPOSED AND SEWAGE-FREE SPARTINA SALT MARSHES,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
E. A. McMahan, R. L. Knight, and A. R. Camp.
Environ Entomol. Vol 1, No 2, p 244-252. 1972. Illus.
Identifiers: Amphipods, *Arthropods, Marshes, Populations, *Salt marshes, *Sewage effluents, *Spartina, Spiders.

An investigation of effects of sewage effluents on populations of microarthropods living in Spartina marshes was carried out in the spring and summer of 1970, using primarily a vacuum collecting technique. Comparisons of dominant forms, population densities, and species diversities were made between populations inhabiting marsh grass exposed to fooding by treated sewage wastes and those in nonpolluted areas. Only in the case of spiders and amphipods were significant differences found, with density in both cases being greater in the polluted marsh. Species diversity was relatively high, especially for populations from Spartina growing within margins of artificial ponds, some of which were also exposed to treated sewage wastes.--Copyright 1973, Biological Abstracts, Inc.
W73-10814

GROWTH AND METABOLISM OF OSTREA EDULIS LARVAE,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. A. Gabbott, and D. L. Holland.
Nature, Vol 241, No 5390, p 475-476, February 16, 1973. 3 tab, 9 ref.

Descriptors: *Larvae, *Metabolism, *Energy budget, *Growth rates, Oysters, Efficiencies, Proteins, Carbohydrates, Lipids, Biochemistry, Mollusks, Invertebrates, Marine animals, Animal growth, Chemical analysis.
Identifiers: *Ostrea edulis, Chemical composition, Isochrysis galbana, Tetraselmis suecica.

An energy budget has been calculated for Ostrea edulis larvae in terms of growth and metabolism from data on the changes in biochemical composition of the larvae during development and on the losses of body components during short-term starvation experiments. Three batches of larvae reared at the MAFF Fisheries Experiment Station were kept at 20-22 degrees C in aerated seawater, and fed a mixed algal diet of Isochrysis galbana and Tetraselmis suecica. On release day zero and days 4,8, and 12, samples of approximately 10-15,000 larvae were collected, counted, and analyzed for protein, lipid, and carbohydrate content. Further samples of larvae were taken from the main culture vessels and placed without food in aerated seawater for 48 h before biochemical analysis. On release (days 0-2) the daily loss of body reserves was equivalent to an oxygen consumption rate of 0.0006 microliter 02 per larva per hr. The daily loss of reserves for days 4-6 and 8-10 was equivalent to oxygen consumption rates of 0.0025 and 0.005 microliter 02 per larva per hr respectively. The net growth efficiencies K2 for swimming larvae fell from 78.6 percent on release to 55.5 percent on day 10. The daily food requirements (assimilated ration) to support growth and metabolism represented 64.9 percent and 42.3 percent of the body weight on day 0 and day 10 respectively. (Holoman-Battelle)
W73-10847

GEOGRAPHIC DIFFERENCES IN PHYTOPLANKTON SENSITIVITY TO PCBS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
N. S. Fisher, L. B. Graham, E. J. Carpenter, and C. F. Wurster.
Nature, Vol 241, No 5391, p 548-549, February 23, 1973. 1 fig, 1 tab, 14 ref.

Descriptors: *Polychlorinated biphenyls, *Diatoms, *Toxicity, *Water pollution effects, Phytoplankton, Estuarine environment, Aquatic habitats, Chrysophyta, Marine algae, Continental shelf, Cultures, Plant growth.
Identifiers: *Fragilaria pinnata, *Thalassiosira pseudonana, *Bellerochia, *Clones, Marine environment, Sensitivity, Sargasso Sea, Data interpretation, Oyster Pond, Great South Bay, Moriches Bay, Sample preservation.

An investigation has been made of the toxicity of PCBs to three species of diatoms, comparing clones isolated from the relatively stable Sargasso Sea waters with those from fluctuating estuarine environments. Cells of Thalassiosira pseudonana, Fragilaria pinnata and Bellerochia sp were grown axenically in f/2 medium. Exponentially growing cells were inoculated onto a sterile medium to which 10 ppb PCBs (Aroclor 1254) was added. The cultures were maintained at 20 degrees C and illuminated 14 h/day; one-ml samples were fixed with Lugol's solution and counted with a Speirs-Levy eosinophil counter. Although growth of all seven clones tested diminished with PCB treatment, isolates from the Sargasso Sea invariably were more sensitive than were clones from estuaries and the continental shelf. Both Bellerochia clones were more sensitive than all others tested. Two-way analyses of variance on the logarithmically transformed data showed that, at 95 h, the interaction term between PCB treatment and geographic origin was significant for T. pseudonana, and for Bellerochia sp., indicating algal sensitivity was highly dependent on the sites of isolation. (Holoman-Battelle)
W73-10849

HEAVY METALS IN BRITISH WATERS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W73-10851

FROZEN PREPARED MICROBIOLOGICAL CULTURE MEDIA,
Philadelphia Coll. of Pharmacy and Science, Pa. Dept. of Bacteriology.
For primary bibliographic entry see Field 05A.
W73-10857

SLIME-INHABITING GEOFUNGI IN A POLLUTED STREAM (WINTER/SPRING),
Washington Univ., St. Louis, Mo. Dept. of Biology.
J. Noell.
Mycologia, Vol 65, No 1, p 57-66, January-February 1973. 1 fig, 4 tab, 13 ref.

Descriptors: *Water pollution, *Isolation, *Sewage effluents, Aquatic fungi, Missouri, Water sampling, Yeasts, Aquatic environment, Organic loading, Spatial distribution, Temporal distribution.
Identifiers: *Geofungi, Hyphomycetes, Sugar Creek, Culture media, Selective media, Agars, Phycomycetes, Fusarium, Phoma, Cladosporium, Verticillium, Epicoccum, Gliocladium, Alternaria, Acremonium, Aspergillus, Pestalotia, Curvularia, Geotrichum, Rhinocladiella, Diplodia, Cylindrocladium, Sporothrix, Paecilomyces, Ceratocystis capillifera, Ceratocystis moreau, Coprinus, Penicillium, Trichoderma.

Samples were taken biweekly for 4 months (winter to spring) from sites above and below the sewage effluent outfall in Sugar Creek (Missouri). Slime was removed with sterile implements from rocks in and 25 cm from the bank of the channel. After suspension in sterile water, small pieces were plated onto isolation medium. Colonies arising on the isolation medium were transferred to corn meal agar for identification. Species of Penicillium and allied genera were transferred to Czapek's solution agar for identification. Excluding Geotrichum and yeasts (ca. 400 ioslates), some 20 genera accounted for approximately 700 isolates. Numbers vary from 220 for Penicillium species to only eight for Curvularia. Species of several interesting genera were isolated only once or twice. These included Rhinocladiella, Diplodia, Cylindrocladium, Sporothrix, Paecilomyces, and two non-Hyphomycetes, Ceratocystis capillifera, C. moreau and a Coprinus sp. In addition, a few sterile forms and a variety of Phycomycetes were isolated. Of 689 isolates, 290, representing 42 percent of the total, were recovered from the channel; 399, or 58 percent, were recovered near the bank. Distribution of isolates by site and collection date shows temporal and spatical variation between genera. Distinct differences in number and type of isolates between channel and edge sites, and above and below the effluent outfall are noted. Problems of studying geofungi in aquatic systems and the significance of their presence are discussed. (Holoman-Battelle)
W73-10859

BIOLOGY OF SEA MUSSELS (MYTILUS CALIFORNIANUS (CONRAD) AND M. EDULIS (LINN.)) BEFORE AND AFTER THE SANTA BARBARA OIL SPILL (1969),
British Columbia Univ., Vancouver. Dept. of Zoology.
J. R. E. Harger, and D. Straughan.

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Water, Air, and Soil Pollution, Vol 1, No 4, p 381-388, September 1972. 7 tab, 13 ref.

Descriptors: *Oil spills, *Water pollution effects, *Mussels, Oil pollution, Biomass, Clams, Mollusks, Invertebrates, Shellfish.
Identifiers: *Mytilus californianus, *Mytilus edulis, *Santa Barbara oil spill, Macroinvertebrates, Data interpretation, Carpenteria Reef, Santa Barbara Harbor, Ellwood Pier, Goleta Point.

Effects of the 1969 Santa Barbara Oil Spill on sea mussels were investigated by comparing biomass characteristics of mussel populations in polluted and clean areas before, during, and after the discharge. In accordance with directions outlined by Connell (1971) the following null hypotheses were tested: (a) Mussels collected in August 1969 from areas experiencing oil pollution were not lighter in body weight than those collected from the same locations in previous years. (b) Mussels collected from areas experiencing oil pollution in August 1969 were not lighter in body weight than those collected in subsequent years from the same locations. Animals in exposed areas were not significantly lighter in body weight than those in clean areas. Likewise no deleterious effect in the form of lowered body weights could be detected in mussels from polluted areas in three successive years subsequent to the oil spill. Mussels were not sampled until 7 mo after the initial spill so that any immediate deleterious effect generated by the oil could have been compensated for by the time of examination. It is noted that the spill in question occurred at a time of minimal growth on the part of the sea mussels involved and that an adverse response might have resulted if the oil had washed ashore during a period of heightened growth. (Holoman-Battelle)
W73-10866

EFFECTS OF KRAFT MILL EFFLUENT ON A MARINE BENTHIC COMMUNITY,
Bedford Inst., Dartmouth (Nova Scotia).
D. L. Peer.
Water, Air, and Soil Pollution, Vol 1, No 4, p 359-364, September 1972. 1 fig, 1 tab, 9 ref.

Descriptors: *Pulp wastes, *Water pollution effects, *Benthic fauna, *Biological communities, Bottom sampling, Sediments, Nematodes, Crustaceans, Annelids, Suspended solids, Marine animals, Speciation, Amphipoda, Isopods, Invertebrates, Flocculation, Effluents, *Canada.
Identifiers: *Marine environment, Data interpretation, Polychaetes, Nemerteans, Van Veen grab, Sample preservation, Cumacea, Scuds, Arthropods, Nephtys, Leanira, Glycera, Tellina agillis, Echinarachnius parma, Lumbrineris fragilis, Scoloplos armiger, Laonice cirrata, Phyllodoce mucosa, Pholoe minuta, Tharyx acutus, Sternaspis fosser, Pectinaria hyperborea.

A quantitative survey of a marine benthic community was taken just prior to the discharge nearby of a bleached kraft paper mill and the area was surveyed again 2 yr later. Ten quantitative benthos samples were taken at each of three sites using a 0.1-m Van Veen bottom grab. The contents were sieved through an 0.8-mm mesh and the residue was preserved in a solution of 10 percent formalin and seawater. The animals were hand sorted from the sediment residue, separated into taxonomic groups, counted, blotted, and weighed. It was concluded that: there has been a change in the composition of the benthic community since 1967; some of these changes may be accounted for by the reduction in tidal currents and resulting changes in sediment particle size composition; and the main cause of the changes is the flocculation of material from the mill effluent. It is not known whether the animals are responding to the physical effect of the flocculated material or to toxic compounds contained by it. (Holoman-Battelle)
W73-10869

TOWARDS PRODUCTION BIOLOGY IN RUNNING WATER ECOSYSTEMS,
Freiburg Univ. (West Germany). Limnologisches Institut.
J. Schwoerbel.
Verh Dtsch Zool Ges. 65, p 57-65, 1971. Illus. English summary.
Identifiers: Algae, Bacteria, Biology, Ecosystems, *Food chains, *Odagmia-Ornata, Pollution, Water pollution effects, *Nutrients, Productivity.

Running waters are open steady state systems. The quantity of produced matter depends on the nutrients in the flowing water and the consumption of the primary produced or allochthonous matter by the secondary producers. The nutrient exchange between sediment and water regulate the nutrition level in the downstream flowing water. The larvae of Simuliidae, for instance, shows that most of the drifting organic matter, detritus, algae, and bacteria, in the flowing water is well filtered but not used by the filtering consumers. The feeding rate of the larva of Odagmia ornata is 6.5 microgram dry weight yeast/animal. Nevertheless, bacteria are the most important basis for food chains in polluted running waters.–Copyright 1973, Biological Abstracts, Inc.
W73-10871

EFFECT OF SEAWATER SOLUBLE FRACTION OF KEROSENE ON CHEMOTAXIS IN A MARINE SNAIL, NASSARIUS OBSOLETUS,
Woods Hole Oceanographic Institution, Mass.
S. M. Jacobson, and D. B. Boylan.
Nature, Vol 241, No 5386, p 213-215, January 19, 1973. 2 tab, 9 ref.

Descriptors: *Bioassay, *Snails, *Water pollution effects, *Oil pollution, *Animal physiology, Laboratory equipment, Invertebrates, Oil spills, Sea water, Marine animals.
Identifiers: *Kerosene, Nassarius obsoletus, Benzene, Naphthalene, Macroinvertebrates, Crude oil, Chemotaxis.

Two experiments were condutced to determine the effect of soluble fractions of kerosene in seawater on the food-finding ability of the marine prosobranch snail, Nassarius obsoletus. Experiments were conducted in Y-shaped plastic chambers constructed so that flowing seawater entered at the two arms. One arm was randomly chosen to receive the stimulus, oyster extract in one experiment and scallop extract in the other. Snails were starved for 10 days prior to the test, and their movement was recorded in chambers containing seawater alone, attractant, kerosene extract, or attractant plus kerosene extract. Concentrations of oyster and scallop extracts were 0.33 ppm and 3 ppm, respectively. Kerosene extracts were prepared either by mixing with seawater and separating the aqueous and oil layers or by extracting four times with pentane. Concentrations used in the experiments were 1 and 4 ppm. The results show that minute quantities of seawater-soluble fractions of kerosene interfere with the chemically mediated attraction to food extracts in Nassarius obsoletus. Oil components may disrupt chemically mediated behavior of other organisms. Further study in this area is recommended. (Little-Battelle)
W73-10872

DISTRIBUTION OF VIBRIO PARAHAEMOLYTICUS IN THE NATURAL ENVIRONMENT,
Washington Univ., Seattle. Inst. for Food Science and Technology.
For primary bibliographic entry see Field 05B.
W73-10875

ECOLOGICAL SIGNIFICANCE OF THE DISCHARGE OF TREATED WASTE WATERS INTO COASTAL WATERS,
Southern California Coastal Water Research Project, Los Angeles.
G. E. Hlavka.
Journal of Milk and Food Technology, Vol 36, No 1, p 23-27, January 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Waste water (Pollution), Waste treatment, Water pollution effects, Water pollution sources, *Water quality standards, Research and development, *Waste identification, *Multiple-purpose projects, *Pollutants, Path of pollutants, Bioindicators, Aquatic life, Water analysis, Ecology, Ecological distribution, Environmental effects, Sediments, Soil analysis, Aquatic soils, Chemical analysis, Trace elements, Heavy metals, Radioisotopes, Oil spills, Water sampling, Coliforms, Marine fish, Invertebrates, Mollusks, Shellfish, Clams, Gastropods, Eutrophication, DDT, Lead, Bioassay, Biota, Fishparasites, Fish diseases, Benthos, Laboratory tests.
Identifiers: *Coastal waters, *Southern California Bight, Chlorinated hydrocarbons, Mytilus californianus, Pollicipes polymerus, Pisaster ochraceus, Haliotis cracherodii, Particulate matter, Neuston, Macroinvertebrates, Paralabrax nebulifer, Sand bass, Oryzias latipes, Japanese rice fish.

The Southern California Coastal Water Research Project (SCCWRP) is attempting to attain a substantial understanding of the ecology of the coastal waters of Southern California. The goals and objectives of the project are to: (a) determine the input rates and distribution of the substantial and trace-level organic and inorganic materials entering the coastal waters; (b) investigate the natural phenomena of the Southern California Bight in present and recent times; (c) determine the effects of man on the coastal waters and distinguish them from natural phenomena; (d) develop indices of environmental health; (e) develop the capacity to predict man-induced effects on the coastal waters; and (f) determine the methods by which the coastal water environment may be enhanced. The findings should be useful in efforts to limit harmful effects and to promote enchancement of the coastal environment. The major effort thus far has been an information search in 17 task areas of physical and chemical oceanography, marine biology, and environmental engineering. In addition, several new research projects have been started under SCCWRP direction. Discussed are some of the technical problems associated with such an effort such as quantifying the natural fluctuations of physical, chemical, and biological parameters; establishing environmental criteria; and correlating observed effects with pollutant distributions. (Holoman-Battelle)
W73-10876

REDUCTION OF MERCURY WITH CYSTEINE IN COMMINUTED HALIBUT AND HAKE FISH PROTEIN CONCENTRATE,
National Marine Fisheries Service, Seattle, Wash. Pacific Fishery Products Technology Center.
J. Spinelli, M. A. Steinberg, R. Miller, A. Hall, and L. Lehman.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 264-268, March/April 1973. 5 fig, 6 tab, 17 ref.

Descriptors: *Separation techniques, *Mercury, *Fish, Hydrogen ion concentration.
Identifiers: *Biological samples, *Cysteine, Removal, Sample preparation.

A study was made to determine the effectiveness of cysteine in reducing the mercury content of comminuted fish and fish protein concentrate (FPC). Comminuted fish tissue was extracted with 0.1 M NaCl containing cysteine HCl.H2O in concentrations ranging from 0 to 0.5 percent. The amount of Hg that could be extracted from the fish was related to the concentrations of cysteine and the pH of the tissue, but the relation was not linear. The most efficient use of cysteine in reducing the Hg content of comminuted fish was obtained when the cysteine-containing extraction solution was percolated through the fish contained in the column. When cysteine was used in an aque-

ous system, only minimal cysteine (4-8 percent) residues were left in the product, indicating that cysteine does not bind irreversibly with the fish proteins. (Little-Battelle)
W73-10878

A SEARCH: NEW TECHNOLOGY FOR PAVEMENT SNOW AND ICE CONTROL,
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W73-10883

PESTICIDE-SEDIMENT-WATER INTERACTIONS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 05B.
W73-10892

THE EUTROPHICATION IMPLICATIONS OF INTERACTIONS BETWEEN NATURALLY OCCURRING PARTICULATES AND METHANE OXIDIZING BACTERIA,
Ohio State Univ., Columbus. Dept. of Microbiology.
T. L. Weaver, and P. R. Dugan.
Water Research, Vol 6, No 7, p 817-828, 1972. 10 fig, 1 tab, 8 ref. OWRR A-027-OHIO (1).

Descriptors: *Methane, *Eutrophication, *Kaolinite, *Oxidation, *Clay minerals, Carbon, Algae, Land management, Bacteria, Carbon dioxide, Inorganic compounds, Diatoms, Suspended solids, Cycling nutrients, Particle size, Organic compounds, Nutrient removal.
Identifiers: Methane carbon, Particulate matter, Methane oxidation.

One of the main factors affecting methane carbon recycling and thereby eutrophication is the variety and quantity of suspended particulate material in the water column. Oxidation of methane by bacteria is markedly affected by organic and inorganic particulate materials which largely determine how much methane will be oxidized and retained in the aquatic ecosystem. Methane oxidation, in turn, greatly influences carbon accumulation which will at least partially govern the rate of eutrophication. The effects of various types of clays on methane oxidation are compared. It can be postulated that the type of non-clay insoluble inorganic particulates existing in a body of water can have an important effect on methane carbon retention. In studying effects of constantly illuminated algae upon methane oxidation, varying degrees of inhibition were observed with Anacystis nidulans, Chlorella vulgaris, and Anabaena variabilis whereas Schizothrix calciocola had no effect on methane uptake. It was also evident from control experiments that algal cells alone do not take up detectable quantities of methane. Suggestions are given for several 'particulate management' practices to partially control eutrophication. Another speculation would be seeding lakes with algae known to inhibit methane oxidation. (Jones-Wisconsin)
W73-10893

COMPETITION BETWEEN AN ALGA AND AN AQUATIC BACTERIUM FOR PHOSPHATE,
Cornell Univ., Ithaca, N.Y.
G-Y. Rhee.
Limnology and Oceanography, Vol 17, No 4, p 505-514, 1972. 5 fig, 4 tab, 34 ref. OWRR B-024-NY (1).

Descriptors: *Competition, *Algae, *Aquatic bacteria, *Phosphates, *Scendesumus, *Pseudomonas, Phytoplankton, Growth rates, Limiting factors.

Whether phytoplankton are capable of competing with aquatic bacteria for phosphates in vitro, the mechanism of such action, and the physiological basis of their competitive ability were determined. Scenedesmus and Pseudomonas were grown in pure and mixed cultures. Growth of each in the mixed culture was compared to that in pure cultures and phosphate removal from the media was followed at the same time. Specific growth rates of algae and bacteria in various phosphate concentrations and their increase in volume and number were measured. Algal growth was severely limited in the presence of bacteria, but bacterial growth was hardly affected by algae. First sign of competition in mixed cultures (cessation of exponential algal growth) was always observed some time after the external phosphate had been exhausted. The faster growth rate of bacteria accounted for the suppressed growth of the algae in mixed cultures. The first sign of competition in algae appeared when the concentration of surplus phosphorus within the algal cell dropped to a critical value near zero. The surplus phosphorus appeared to consist of three or all four inorganic polyphosphate fractions. (Jones-Wisconsin)
W73-10894

PRODUCTIVITY PROBLEMS OF FRESHWATERS.
Polish Academy of Sciences, Warsaw. Inst. of Ecology.

Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland. PWN Polish Scientific Publishers, Warsaw, 918 p, 1972. 58 fig, 56 tab, 1127 ref.

Descriptors: *Productivity, *Eutrophication, *Food chains, Primary productivity, Secondary productivity, Ecology, Fish management, Fertilization, Trophic level, Organic matter, Water pollution, Self-purification, Biodegradation, Energy budget, Mathematical studies, Statistical models, Simulation analysis, Ecosystems.
Identifiers: International Biological Program, UNESCO.

Participants in this symposium included 94 scientists from 27 countries of Europe, America, Asia, Africa, and Australia, in addition to a large number of Polish hydrobiologists, who presented production studies as undertaken in their countries within the framework of the IBP. Of special significance was the appraisal of particular problems by working groups arranged as follows: Primary production and efficiencey of its utilization, Secondary production and efficiency of its utilization including fish production, Organic matter transformation and microbiological processes in biological budgets of waters, Production studies as an aid in dealing with manmade changes in waters (eutrophication, pollution, selfpurification), Bioenergetics of aquatic organisms as a background for understanding production process in natural waters, and general problems--Biological budgets of water bodies. The first step toward application of mathematical theories of systems and mathematical simulations of ecosystems has been taken, and contributions are included, although the gap was not completely closed between the description and understanding, between the empiracal assembly of facts and theoretical conclusions. The contents are divided into general categories, titled 'Production studies on the whole ecosystem or at least two trophic levels,' 'One level production studies and particular production problems,' and 'Regional studies and surveys.' (See W73-10896 thru W73-10933) (Auen-Wisconsin)
W73-10895

BIOLOGICAL PRODUCTIVITY OF LAKES KRIVOE AND KRUGLOE,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Instut.
A. F. Alimov, V. V. Boullion, N. P. Finogenova, M. B. Ivanova, and N. K. Kuzmitskaya.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Fresh waters, May 6-12, 1970, Kazimerz Dolny, Poland, p 35-56, 1972. 3 fig, 14 tab, 9 ref.

Descriptors: *Productivity, *Primary productivity, *Energy budget, Phytoplankton, Benthic fauna, Zooplanton, Organic matter, Biomass, Biological communities, Cold regions, Animal metabolism, Energy conversion, Energy transfer, Photosynthesis, Benthos, Diatoms.
Identifiers: *Lake Krivoe (Karelia), *Lake Krugloe (Karelia), Energy values.

Studies were made of the biological productivity in Lakes Krivoe (oligotrophic) and Krugloe (bog lake) on the White Sea coast of Karelia, 30 km south of the Polar Circle. A negative balance of organic matter is typical of both lakes and both are poor in cutrients. They have low values of primary production which are represented mainly by phytoplankton with almost no higher water plants and a weak periphyton. The maximum plankton photosynthesis was observed in the surface water; photosynthesis rapidly decreases with depth, especially in the less transparent Lake Krugloe. Excess destruction over production indicates a great role of allochthonous organic matter in the biological budget. Of the 128 algal taxa (six types), the dominant species belong to cosmopolitan algae: Significant are the northern Alpian forms of Melosira and Dinobryon. Diatom species amount to almost 70%, largely rare forms. Zooplankton of both lakes include 23 Rotatoria, 9 Cladocera, 2 Copepoda. Benthic animals consist mainly of widely distributed holarctic and palaearctic species, some typical of cold water habitats. The profundal of Lake Krivoe is inhabited by glacial relicts. Benthos is characteristic of the somewhat impoverished fauna of northern Karelia. The main elements of the energy budget of these waters are tabulated. (See also W73-10895) (Auen-Wisconsin)
W73-10896

THE SEASONAL VARIATION OF SOME ECOLOGICAL EFFICIENCIES AND PRODUCTION RATES IN THE PLANKTON COMMUNITY OF SEVERAL POLISH LAKES OF DIFFERENT TROPHY,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
A. Hillbricht-Ilkowska, I. Spodniewska, T. Weglenska, and A. Karabin.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland, p 111-127, 1972. 5 fig, 1 tab, 29 ref.

Descriptors: *Productivity, *Seasonal, *Primary productivity, *Phytoplankton, *Zooplankton, *Trophic level, Predation, Photosynthesis, Nannoplankton, Plankton, Biomass, Crustaceans, Biological communities.
Identifiers: *Poland, Mikolajskie Lake (Poland), Taltowisko Lake (Poland), Sniardwy Lake (Poland), Flosek Lake (Poland).

Analysis was made of environmental and seasonal variation of primary production (Phytoplankton), production of filter-feeders (non-predatory zooplankton), and production of planktonic predators in lakes Mikolajskie (eutrophic, halomictic), Sniardwy (eutrophic, palimictic), Taltowisko (mesotrophic, halomictic) and Flosek (dystrophic) of Poland. Biomass of phyto- and nannoplankton was estimated; production and biomass of rotifers and crustaceans were calculated separately. To determine extent of consumer food supply utilization, two groups were distinguished having a different range of food selectivity--microconsumers and macroconsumers. Lakes of a lower trophic status showed greater phtosynthetic effeciency and nannoplankton share in production when compared with a typically eutrophic lake. Net production of filter feeders in eutrophic, mesotrophic and dystrophic lakes was similar and rather large, while it was strikingly small in the dystrophic lake

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constantly and strongly mixed. The data from a special experiment in situ and calculated interlevel efficiencies were used to analyze the extent of utilation of phytoplankton production, including that of nannoplankton, by filter feeders and the reduction of the latter by predators. The variation of the values of production rates, the mean daily P/B coefficient, was also analyzed for successive links in the production process. (See also W73-10895) (Jones-Wisconsin)
W73-10897

THE PRODUCTION PROCESSES IN SEVERAL POLISH LAKES,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology; and Warsaw Univ. (Poland). Dept. of Hydrobiology.
A. Kajak, A. Hillbricht-Ilkowska, and E. Pieczynska.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland, p 129-147, 1972. 1 fig, 7 tab, 46 ref.

Descriptors: *Productivity, *Secondary productivity, *Primary productivity, Zooplankton, Benthic fauna, Littoral, Plankton, Tripton, Decomposing organic matter, Epilimnion, Hypolimnion, Bottom sediments, Organic matter, Biomass, Biological communities, Benthos, Biodegradation, Periphyton, Aquatic plants, Profundal zone, Photosynthesis, Phytoplankton.
Identifiers: Mikolajskie Lake (Poland), Taltowisko Lake (Poland), Sniardwy Lake (Poland), Flosek Lake (Poland), Warniak Lake (Poland), Pelagic zone.

Production processes of five Masurian, trophically different, lakes were examined by detailed analysis of production, biomass and trophic relations among particular groups of organisms and dominating species, by estimating organic matter, input and output, and by comparing primary production and tripton sedimentation. The pelagic zone is of greatest significance in organic matter production: in Mikolajskie Lake net primary production in the littoral zone forms 21%, and in the pelagic zone 79% of the total lake primary production. Zooplankton productivity greatly exceeds that of zoobenthos. About 30% of net primary production is sedimentated as tripton, most of which is decomposed in bottom deposits. Efficiency of benthos production relative to tripton is similar to efficiency of zooplankton relative to primary production. Total net primary production plus allochthonous organic matter is efficiently utilized in secondary production, including the roughly-estimated production of heterotrophic bacteria. Decomposition takes place mainly in the epilimnion. Significance of hypolimnion and of bottom deposits in decomposition processes is similar and not great. Decomposition is intensive in eulittoral, but, since the eulittoral is only a small part of the entire lake, its share in the total decomposition processes is not especially signigicant. (See also W73-10895) (Jones-Wisconsin)
W73-10898

THE MODELLING OF THE ECOSYSTEM OF LAKE DALNEE ON AN ELECTRONIC COMPUTER,
F. V. Krogius, E. M. Krokhin, and V. V. Menshutkin.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland, p 149-164, 1972. 9 fig, 1 tab, 50 ref.

Descriptors: *Productivity, *Model studies, *Ecosystems, *Input-Output analysis, Computers, Primary productivity, Fish, Seasonal, Energy transfer, Organic matter, Respiration, Predation, Dynamics, Biomass.
Identifiers: *Lake Dalnee (Kamchatka), Kamachatka (USSR).

The first experience in modelling the whole ecosystem of Lake Dalnee, Kamchatka, USSR, was carried out as a composition of finite automatons with description of the modelling algorithm in the language of logic algebra. On this first model was traced the whole path leading to the solution of the problem of optimum utilization of the natural resources of lakes. The objective of the investigation was not so much to solve, as to demonstrate the possibility of a quantitative solution of the problem of rational utilization of the biological, hydroenergetical and other resources of natural bodies of water. The basic indices of the annual biotic balance of the ecosystem of Lake Dalnee and the corresponding data obtained are presented. In proceeding from mere relative values: coefficients of exchange expenditures, natural mortality, maximum rations and some others (selected not always on a suffieiently theoretical basis, especially in respect to bacteria) as well as from the temperature and light regime of the lake, a plausible dynamic picture of the lake ecosystem was obtained. This offers a basis for the problem of potimum control of lake ecosystems, not very reliable, but fundamental. (See also W73-10895) (Jones-Wisconsin)
W73-10899

BIOLOGICAL PRODUCTIVITY AND BALANCE OF ORGANIC SUBSTANCE AND ENERGY IN LAKE BAIKAL,
B. K. Moskalenko, and K. K. Votinsev.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 207-226, 1972. 9 fig, 13 tab, 3 ref.

Descriptors: *Productivity, *Organic matter, *Energy budget, Biomass, Food chains, Solar radiation, Zooplankton, Fish, Respiration, Primary productivity, Bullheads.
Identifiers: *Lake Baikal (USSR), Pelagic zone, Comephorus, Seals, Coregonus autunalis.

Results of long-term complex investigations on biological productivity of the pelagic zone of oligotrophic Lake Baikal, USSR, are presented. Biomass volume, production regularities within the major groups of pelagic complex organisms, change in the numerical density and changeability of species in space and time, organism-environment relations and nutritional links between the organisms in different trophic levels were studied to arrive at conclusions for the prospects of increasing profitability of the fish economy. Average microalgal biomass and its seasonal fluctuations are given. The dominant organism of the Baikal zooplankton is the copepod, Epischura baicalensis; in deep water its biomass in summer is from 80 - 95% of the total zooplankton biomass. The fish population of the Baikal pelagial zone is chiefly composed of endemics: two species of pelagic bullheads and two Comephorus species. The ways of increasing the economically-profitable output are to increase growth of the Coregonus flock by intensifying natural reproduction and by artificial breeding. Also introduction of new species of fish should not interfere with the historically developed ichthiofauna complex. Estimations show that Lake Baikal can be converted into a large-scale industry of freshwater salmons and Coregonus. (See also W73-10895) (Jones-Wisconsin)
W73-10900

DISTRIBUTION PATTERN OF PHYTOPLANKTON AND BACTERIA, MICROBIAL DECOMPOSITION OF ORGANIC MATTER AND BACTERIAL PRODUCTION IN EUTROPHIC, STRATIFIED LAKE,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
J. Overbeck.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 227-237. 1972. 6 fig, 1 tab, 23 ref.

Descriptors: *Productivity, *Distribution patterns, *Phytoplankton, *Bacteria, *Microbial degradation, Eutrophication, Stratification, Organic matter, Metabolism, Food chains, Energy transfer, Plant physiology, Kinetics, Model studies, Biomass.
Identifiers: Plussee (Plon), Germany.

Studies on heterotrophic bacteria in eutrophic Plussee, Germany, are presented, especially the physiological mechanisms. The mean percent share of carbon dioxide-dark fixation in the bacterial biomass in the lake amounts to 6.6. Assuming the mean part of heterotrophic C-14 fixation in bacterial biomass as 6, the heterotrophic production can be calculated by measuring the heterotrophic carbon dioxide-fixation, although exact physiological studies are still to be performed. Autotrophic production occurs in the supper zone of the lake. These processes are important since the organic substance, liberated by autolysis of excretion of phytoplankton, is converted at once into particulate substance and is thus available to herbivore zooplankton. Data for an extensive computer analysis of distribution pattern of phytoplankton and bacteria were prepared. In the first half of summer, with remarkable autotrophic production in the epilimnion, a significant correlation of the biomass of bacteria to the phytoplankton was observed. After interruption of autotrophic production by phosphate depletion, the bacterial biomass dropped down to the hypolimnion and was correlated with phototrophic bacteria. Application of kinetic parameters for determination of microbial activities in water bodies offers a dynamic approach to aquatic microbiology and supplements computer calculations. (See also W73-10895) (Jones-Wisconsin)
W73-10901

THE PRODUCTION PROCESSES IN TWO HIGH-MOUNTAIN LAKES (VOR-DERER AND HINTERER FINSTERTALER SEE, KUHTAI, AUSTRIA),
Innsbruck Univ. (Austria). Inst. of Zoology.
G. Bretschko, P. Gollmann, H. Pfeifer, R. Pechlaner, and H. P. Weissenbach.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 239-269. 1972. 29 fig, 2 tab, 14 ref.

Descriptors: *Productivity, *Alpine, *Lakes, *Energy transfer, Phytoplankton, Nannoplankton, Bacteria, Rotifers, Copepods, Benthic fauna, Fish, Water chemistry, Primary productivity, Photosynthesis, Benthos, Periphyton.
Identifiers: Finstertaler See Kuhtai (Austria).

Vorderer and Hinterer Finstertaler See, lying above the timber line of the Central Alps at elevations of 2237 and 2256 meters were studied as type specimens of high-mountain lakes as models for more complex water bodies. Temperature, water chemistry, radiation, phytoplankton, bacteria, zooplankton, bottom flora, bottom fauna and fish were evaluated. Species composition of phytoplankton does not change essentially throughout the year, therefore differences in the activity coefficient are mainly due to alterations in environmental factors and physiological properties of the taxa concerned. Among the environmental factors light intensity and nutrient (phosphorus) limitations control phytoplankton production rates in the course of the year. Biomass of bacteria in both lakes is only slightly smaller than standing crops found in lowland lakes and is in the same order of magnitude as phytoplankton. Secchi disc transparencies have been plotted as there could be causal relations between turbidity and bacterial concentration. The zooplankton community is extremely simple: two rotifers and a single copepod form about 99% of the zooplankton. The terminal producers of both lakes are two salmonids, Salmo trutta f. fario and Salvelinus alpinus. (See also W73-10895) (Jones-Wisconsin)
W73-10902

PRODUCTION AND DECOMPOSITION IN THE EULITTORAL ZONE OF LAKES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
E. Pieczynska.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 271-285. 1972. 1 fig, 3 tab, 15 ref.

Descriptors: *Primary productivity, *Productivity, *Decomposing organic matter, *Energy transfer, *Littoral, Lakes, Organic matter, Water levels.
Identifiers: Masurian Lake District (Poland), Eulittoral zone.

The eulittoral is a transitional zone between lake and surrounding land, that area between maximal and minimal water level and neighboring areas, splashed or exposed by waves. This zone was studied in several lakes of the Masurian Lake District in Northern Poland. Its sources of organic matter are distinguished: productivity of the area, organic matter brought from the lake, and organic matter of terrestrial origin. Rate of decomposition of the several kinds of organic matter and the ways they participate in the energy flow are discussed. Two basic aspects of eulittoral energy flow can be distinguished. It is a zone characterized by intensive primary production and determines largely productivity of the water body. Main factors affecting the eulittoral are configuration of shore terrace, shore line development and water level fluctuations. Secondly, the eulittoral stores various kinds of matter of terrestrial and lake origin, frequently difficult to decompose (tree leaves, macrophytes), not used as direct food by consumers. This matter, after partial decomposition, when hydrological conditions change (changes in the water level), gets into the other lake zones in a reduced amount but in a form accessible for the consumers. (See also W73-10895) (Jones-Wisconsin)
W73-10903

THE CHAR LAKE PROJECT. A STUDY OF ENERGY FLOW IN A HIGH ARCTIC LAKE,
Toronto Univ. (Ontario). Dept. of Zoology.
F. H. Rigler.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 287-300. 1972. 5 fig, 3 tab, 17 ref.

Descriptors: *Productivity, *Energy budget, *Arctic, *Lakes, Geology, Climates, Water chemistry, Physical properties, Nutrient, Zooplankton, Algae, Benthos, Conductivity, Phytoplankton, Nannoplankton, Biological communities, Protozoans, Fish, Mosses, Crustaceans, Thermal properties, Limiting factors.
Identifiers: *Char Lake (Canada).

Biological simplicity of arctic lakes, ideal for studies to quantitate energy flow through a food chain, combined with their constant thermal regime, makes them excellent for testing hypotheses concerning the relation between biological diversity and stability. Char Lake, Cornwallis Island, Canada, was investigated and its geology, climate, morphometry, and simple chemical characteristics are described. In general, the communities are much less diverse than those in a comparable temperate lake. Net phytoplankton is sparse with nannoplanktonic flagellates and diatoms the dominant groups. Zooplanktoon is sparse; Limnocalanus macrurus and Keratella cochlearis are the only multicellular species and are present throughout the year. Ciliated protozoans are abundant but unidentified. The only fish is Salvelinus alpinus; the population is land locked. The benthic community is also simple; the only macrophytes are mosses. Eighteen species of invertebrates are known to occur in benthic communities and seven more thought to wash in from streams. Comparative studies of productivity and phosphate uptake kinetics between Char Lake and a fertilized lake suggest that productivity is nutrient limited, but that arctic lakes cannot respond as dramatically as temperate lakes to large nutrient inputs. (See also W73-10895) (Jones-Wisconsin)
W73-10904

LAKE GEORGE, UGANDA. STUDIES ON A TROPICAL FRESHWATER ECOSYSTEM.
Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 301-309. 1972. 4 fig, 6 tab, 11 ref.

Descriptors: *Tropical regions, *Biological communities, *Energy conversion, *Productivity, Lakes, Physicochemical properties, Shallow water, Respiration, Cycling nutrients, Energy transfer, Biomass, Primary productivity, Secondary productivity.
Identifiers: *Lake George (Uganda).

The initial aims of the study were to describe the physical, chemical, and biological conditions in a tropical lake (exemplified by Lake George) and subsequently to investigate the major components of production of selected trophic levels. Preliminary work dealt with hydrology, water chemistry, primary productivity, nutrient flow through the lake, and the ecology of zooplankton, benthic diptera, and fish. Phytoplankton utilization of the bicarbonate ion as a direct carbon source results in a high daily rate of gross production. The equilibium concentrations of dissolved inorganic nitrogen and phosphorus are always low but rate of supply must be sufficient to maintain the low net productivity. An unusual contribution to this lake are the faeces of a large Hippopotamus which frequent the lake. Ratio of the post-primary biomass to that of the primary producers is very small, probably because of an inefficient energy link between the trophic levels due to the energy transfer occurring through the detrital cycle. Fish populations are divided into two groups: species growing to a large size and those of small adult size. One species only, Tilapia nilotica, a herbivore, makes up 80% of the considerable fish harvest. (See also W73-10895) (Jones-Wisconsin)
W73-10905

FUNCTIONS AND INTERACTIONS OF DISSOLVED ORGANIC MATTER AND THE LITTORAL ZONE IN LAKE METABOLISM AND EUTROPHICATION,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel, and H. L. Allen.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 333-347. 1972. 4 fig, 2 tab, 51 ref.

Descriptors: *Productivity, *Organic matter, *Littoral, *Lakes, *Eutrophication, Aquatic plants, Energy budget, Marl, Decomposing organic matter, Cycling nutrients.
Identifiers: *Dissolved organic matter, Lawrence Lake (Michigan).

Recent findings from marl lakes indicate mechanisms involved in the functional roles of dissolved organic matter in relation to the producers of aquatic systems where the inorganic milieu severely suppresses facets of dissolved organic matter cycling and potential productivity. Changes in cycling and partitioning of dissolved organic matter are significant in lake eutrophication and ontogeny. In spite of large reservoirs of inorganic carbon in marl lakes, the highly buffered, alkaline conditions limit availability of carbon to algal and macrophytic photosynthesis. Critical to increased eutrophication is some mechanism of decreasing buffering capacity and carbonate reservoir. Morphometric changes accompanying gradual net increases in sedimentation rates also have significant effects. In closed basins of moderate to small size, marl lake succession can be altered relatively rapidly by the littoral flora, particularly Sphagnum. Supporting data from several lake types are discussed in evidence for interaction models of functional roles of dissolved organic matter in eutrophication ontogeny of lake production stability and maturation. The littoral complex functions as a source of dissolved organic matter that potentially can affect and regulate pelagial autotrophy. Moreover, the littoral zone functions as a chemical and metabolic trap or 'sieve' for allochthonous dissolved and particulate organic and inorganic matter. (See also W73-10895) (Jones-Wisconsin)
W73-10906

THE UNIQUENESS OF SALT LAKE ECOSYSTEMS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
W. D. Williams.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 349-361, 1972. 1 tab, 66 ref.

Descriptors: *Productivity, *Saline lakes, *Ecosystems, *Limnology, Biological communities, Primary productivity, Secondary productivity, Laboratory tests, Energy transfer.
Identifiers: Trophic dynamics, Soap Lake (Wash), Lake Werswrap (Austrailia), Lake Rudolph (E. Africa), Alviso Salterns (Calif).

Attention is focused on the somewhat odd position that inland salt waters occupy in the limnological spectrum. Salt lakes are discrete, simplified, and sometimes very productive ecosystems which provide a spectrum of ecosystem stability and complexity. This paper reviews research on the unique features characterizing inland salt lakes and their biota. The small number of projects dealing with the trophic dynamic relationships of a total ecosystem testify that ecosystems are complex units. Salt lakes have greatly decreased species diversities vis-a-vis freshwater localities, and in the most saline lakes, extremely few species occur. They are, insofar as the dynamics of water (apart from evaporation) and energy flow are concerned, closed systems, perhaps more discrete than any other ecosystem of similar size. Most salt lakes are relatively shallow and this results in decreased habitat heterogeneity. The reduced species diversity and simplified trophic structure derived from the absence of fish and macrophytes and the presence of decreased habitat heterogeneity of salt lakes make them considerably less difficult to study. The major producers appear to be periphytic and planktonic algae. The large recorded values for benthic and zooplankton standing crops are further indication of high secondary production. (See also W73-10895) (Jones-Wisconsin)
W73-10907

SOME INTERIM RESULTS OF SOVIET IBP INVESTIGATIONS ON LAKES,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
G. G. Winberg.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwater, May 6-12, 1970, Kazimierz Dolny, Poland, p 363-381. 1972. 8 fig, 4 tab.

Descriptors: *Productivity, *Lakes, *Energy budget, *Biomass, Primary productivity, Food chains, Respiration, Bacteria, Plankton, Predation, Zooplankton, Benthic fauna, Fish, Trophic level, Phytoplankton.
Identifiers: *USSR, Lake Drivyati (USSR), Lake Krivoe (USSR), Lake Krugloe (USSR), Lake

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Krasnoe (USSR), Lake Naroch (Byelorussia), Lake Myastro (Byelorussia), Rybinsk Reservoir (USSR), Kiev Reservoir (USSR).

Water bodies of various types and different geographical locations were investigated: Lakes Krivoe and Krugloe near the Polar Circle, Lake Krasnoe near Leningrad, three Byelorussian lakes, Lake Drivyati, Rybinsk Reservoir on the Volga River, and the Kiev Reservoir on the Dnieper River. The basic parameters of the energy budget (biomass, production, food ration, respiration) of successive trophic links (producers, bacterioplankton, non-predatory and predatory zooplankton and zoobenthos, fish), the coefficients P/B, and some ecological efficiencies are presented and discussed. The trophic levels of energy utilization should be particularly considered. Quantitative studies of the energy flow should be continued and the applied methods will enable one to clarify both the common characters of the biological energy budget of aquatic ecosystems and its typical characters in water bodies of different types. Special attention should be given to the effect of animals of each trophic level on the composition and biological peculiarities of the preceding one. This facet of interrelationships in the ecosystem can be regarded as a flow of information running in the direction opposite to the energy flow and together with abiotic factors determining the specific composition and characters of organisms of the trophic level. (See also W73-10895) (Jones-Wisconsin)
W73-10908

BIOLOGICAL PRODUCTIVITY OF DIFFERENT TYPES OF LAKES,
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
G. G. Winberg, V. A. Babitsky, S. I. Gavrilov, G. V. Gladky, and I. S. Zakharenkov.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 383-404. 1972. 9 fig, 9 tab, 18 ref.

Descriptors: *Productivity, *Lakes, *Trophic level, *Energy budget, Mesotrophy, Eutrophication, Phytoplankton, Aquatic plants, Bacteria, Zooplankton, Benthic fauna, Benthic flora, Fish, Isotherms, Biological communities, Temperature, Lake morphometry, Solar radiation, Biomass, Photosynthesis, Primary productivity, Chlorophyll, Detritus, Seston, Standing crops, Predation, Biochemical oxygen demand.
Identifiers: Lake Naroch (Byelorussia), Lake Batorin (Byelorussia), Lake Myastro (Byelorussia), Lake drivyati (Russia).

Productivity by phytoplankton, marcrophytes, bacterioplankton, zooplankton, zoobenthos and fish was investigated in mesotrophic Lake Naroch, highly productive eutrophic Lake Batorin, and intermediate type Lake Myastro, Byelorussia, resulting in an approximate biological energy balance for the three different types of lakes. In computing total primary production it was assumed that the P/B coefficient of macrophytes was equal to 1.25, and that the expenditure on respiration for all primary producers was 20% of the gross production. Since production of periphyton was not experimentally determined, it was estimated by taking into account the substrate area suitable for periphyton and lake water optical indices. It was concluded that production of periphyton was close to the production of macrophytes. In mesotrophic Lake Naroch, primary production of phytoplankton was approximately 31% of total primary production, while in Lakes Myastro 87% and in Batorin 96%. Total production by autotrophic organisms in all the lakes was similar. Energy assimilated by autotrophic organisms was 0.30, 0.35, and 0.36% of the total solar radiation. Energy assimilated by bacteria in the vegetative season in Lake Naroch constituted 40% of primary production, in Lakes Myastro and Batorin, 89 and 74%, respectively. (See also W73-10895) (Jones-Wisconsin)
W73-10909

TROPHIC STRUCTURE OF LAKE TATSU-NUMA, AN ACIDOTROPHIC LAKE IN JAPAN, WITH SPECIAL REFERENCE TO THE IMPORTANCE OF THE TERRESTRIAL COMMUNITY,
Yamagata Univ. (Japan). Dept. of Biology.
G. Yamamoto.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 405-419. 1972. 2 fig, 3 tab, 26 ref.

Descriptors: *Productivity, *Trophic level, *Acidic water, *Fish population, Benthic fauna, Sessile algae, Insects, Leaves, Fish food organisms, Fish diets, Minnows, Standing crops, Plankton, Benthos, Food chains, Zooplankton, Phytoplankton, Organic matter.
Identifiers: *Lake Tatsu-numa (Japan), Tribolodon, Moroco.

Several lakes in northeastern Japan, originating from volcanic activity, contain strong mineral acid (pH 1.4 to 5.50). Of these, Lake Tatsu-numa was studied to ascertain mechanisms by which a relatively large fish population is supported in a small area with poor production, and characteristics of biological production of mineral acidotrophic lakes. Only two species of fish, Tribolodon hakonensis hakonensis and Moroco steindachneri steindachneri, inhabit this lake and their production is supported by benthic animals, sessile algae, and terrestrial insects which fall into the water. The fry and juvenile fish depend upon Oedogonium sp., Chydorus sphaericus, and suspended organic particles of the littoral area. Most of the zooplankton are herbivorous and their food was identified as nannoplanktonic algae and organic particles, with the exception of two species of Macrocyclops, which were carnivorous, and a predator-prey relationship was ascertained between Macrocyclops and Chydorus. Production is relatively higher in the littoral area than offshore. The well-developed Phragmites-Salix vegetation, covering 70% of the shore, is the main source of the primary production. The biotic community is fairly simple, with three or four terminal consumers in both the littoral and offshore areas supported mainly by terrestrial organisms rather than organisms produced within the lake itself. (See also W73-10895) (Jones-Wisconsin)
W73-10910

PRODUCTIVITY OF AQUATIC ORGANISM COMMUNITIES OF DIFFERENT TROPHIC LEVELS IN KIEV RESERVOIR,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
D. Z. Gak, V. V. Gurvich, I. L. Korelyakova, L. E. Kostikova, and N. A. Konstantinova.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 447-455. 1972. 1 tab, 8 ref.

Descriptors: *Productivity, *Biological communities, *Aquatic populations, *Energy budget, *Reservoirs, Eutrophication, Primary productivity, Organic matter, Respiration, Benthic flora, Bacteria, Benthos, Herbivores, Aquatic plants, Zooplankton, Vegetation, Phytoplankton, Benthic fauna, Fish, Algae.
Identifiers: *Kiev Reservoir (USSR).

The aquatic communities of three trophic levels in the Kiev Reservoir on the Dnieper River, USSR, were measured, including primary production of phytoplankton, benthic fauna, filamentous algae, and aquatic plants. The difference in input and loss of organic matter was negligible, however, organic matter rich in nitrogen and phosphorus predominated in the matter leaving the reservoir. The total respiratory energy loss of phytoplankton, bacterioplankton, and zooplankton approaches the value of total respiration. The food requirement of bacterioplankton, herbivorous zooplankton, and non-predatory meso- and macrobenthos, and macrofauna living on macrophytes is almost balanced by primary production. The production of bacterioplankton and of all non-predatory animals may be considered as production of the second trophic level. The production of predatory invertebrates and the residual production of the 2nd trophic level form the reserve of the energy resource utilized by fish, accumulated on the bottom in the form of organic detritus, and to be removed by waterfowl and emerging insects. The fish yield during 1967-1968 provided 0.8 kcal/sq m. If the food coefficient is 10, it is calculated that 8.1 kcal/sq m in the form of fish are utilized by man--less than 1% of the total energy supply of the reservoir. (See also W73-10895) (Auen-Wisconsin)
W73-10911

ENERGY FLOW IN AQUATIC ECOSYSTEMS IN INDIA,
Maharaja Sayajirao Univ. of Baroda (India). Dept. of Biochemistry, and Freshwater Biological Station, Madras (India).
S. V. Ganapati, and A. Sreenivasan.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 457-475. 1972. 7 tab, 57 ref.

Descriptors: *Energy budget, *Energy conversion, *Fish harvest, Primary productivity, Solar radiation, Limiting factors, Herbivores, Carp, Photosynthesis, Oxygen, Light intensity, Limnology, Temperature, Nutrients, Respiration, Benthos.
Identifiers: *India, Tilapia, Chanos.

An attempt has been made to describe a semi-empirical method of determining the energy availing relationships in production, respiration, and decomposition without the help of highly sophisticated instruments and methods and without resorting to highly complicated mathematical equations and numerous assumptions. Data from results of studies on primary production extending over several seasons of the years 1962 to 1968 and the annual fish production in five typical fish ponds and two man-made lakes have been used in this exploratory paper for a working model in the determination of seasonal variations in the rates of photosynthesis and the energy flow at two trophic levels. The energy fixed from incident solar radiation varied from 1.1 to 10.0% in the smaller, shallower bodies of water and from 0.21 to 0.98% in the two bigger man-made lakes. As these waters were stocked with young of the truly herbivorous species of Indian carps, Tilapia and Chanos, the secondary fish production was from 0.27 to 1.04% of the fixed carbohydrate energy in the smaller bodies and from 0.022 to 0.092% in the bigger man-made lakes. Comparisons are made with certain West German lakes. (See also W73-10895) (Jones-Wisconsin)
W73-10912

BIOLOGICAL PRODUCTIVITY OF KURAKHOV'S POWER STATION COOLING RESERVOIR,
Akademiya Nauk USSR, Kiev. Instytut Hidrobiologii.
M. L. Pidgaiko, V. G. Grin, L. A. Kititsina, L. G. Lenchina, and M. F. Polivannaya.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 477-491. 1972. 9 tab, 8 ref.

Descriptors: *Productivity, *Energy budget, *Powerplants, *Cooling water, *Reservoirs,

Heated water, Trophic level, Phytoplankton, Benthic flora, Aquatic plants, Bacteria, Zooplankton, Biomass, Benthic fauna, Primary productivity, Secondary productivity, Plankton, Benthos.
Identifiers: *Kurakhov Power Station (USSR).

A study was conducted of the cooling reservoir of the Kurakhov's Power (electric) Station (USSR) during 1965-1968. It is characterized by specific heat load in summer and by a temperature rise of 0.5-3C and satisfies the sanitary standards of the USSR. Species composition and dominating ecosystems are affected principally by geographical location of reservoir, type of water exchange, limnological index (ratio of area to mean depth) for slow flow and flowless reservoirs, and annual expenditure of water for flowing reservoirs. Due to the heated discharge, water temperature in the Kurakhov reservoir exceeds the natural by 5 to 6C in winter and 2 to 4C in summer. The study was carried out in three sections: with natural temperature regime, with weak heating, and with great heating. In comparison with the control section of the reservoir with natural temperature regime, chronic overheating of water of 3.2C (average for year) leads to an increase in early primary and to a decrease in secondary production. The minimum water overheating does not cause a change of trophic level, but provides it. (See also W73-10895) (Jones-Wisconsin)
W73-10913

BIOLOGICAL PRODUCTIVITY OF THE RYBINSK RESERVOIR,
Akademiya Nauk SSR, Moscow. Institut Biologii Vnutrennykh Vod.
Y. I. Sorokin.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 493-503. 1972. 4 fig, 1 tab, 19 ref.

Descriptors: *Productivity, *Reservoirs, *Energy budget, Aquatic life, Metabolism, Bacteria, Phytoplankton, Zooplankton, Benthic fauna, Fish, Crustaceans, Benthos, Food chains, Fish harvest, Biomass, Organic matter, Primary productivity.
Identifiers: *Rybinsk Reservoir (USSR).

The efficiency of biological productivity and energy flux in the Rybinsk Reservoir (USSR) at all trophic levels in given, including phytoplankton, average number of bacterioplankton, microzooplankton, crustacean zooplankton, benthos, and fish population. The average data for 4 years (1964-1968) are tabulated. The phytoplankton organic matter provides only 25% of food consumed by animals, and the 75% is provided by bacteria; Protozoa and Rotifera give about 70% of total zooplankton production. The benthic fauna uses about 20% of total primary food. Fish larvae form the prevailing part of total fish production and are the basic food source for predatory fish. It is evident that the causes of its relatively low productivity are factors peculiar to a big shallow reservoir of the forest zone. Increase of productivity of the basic area appears impossible. Its main purposes are transport, energy, and shortly, water supply. Only partial solutions are recommended: regulation of the fishery, improvement of conditions for fish reproduction, and construction of pond systems in the shore regions. (See also W73-10895) (Jones-Wisconsin)
W73-10914

ENERGY TRANSFORMATIONS THROUGH PRIMARY PRODUCTIVITY AND FISH PRODUCTION IN SOME TROPICAL FRESHWATER IMPOUNDMENTS AND PONDS,
Freshwater Biological Satation, Madras (India).
A. Sreenivasan.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 505-514. 1972. 3 tab, 40 ref.

Descriptors: *Energy conversion, *Energy budget, *Primary productivity, *Fish harvest, Tropical regions, Reservoirs, Ponds, Productivity, Photosynthesis, Temperature, Solar radiation, Light intensity, Physicochemical properties, Plankton.
Identifiers: India.

Tropical areas with high temperature and bright sunshine are ideally suited for conversion of radiant energy for fish production. In connecting fish production with biological dynamics of ecosystems, six reservoirs and seven ponds and lakes in India were studied because of availability of commercial fishery data. In Bhavanisagar Reservoir conversion to fish was lower due to underexploitation of fish. In Amaravathi Reservoir photosynthetic efficiency as well as fish conversion efficiency were highest among the five impoundments due to algal blooms and their effective utilization by planktonphage fishes. The shallow Odathurai tank ranked even below the deep Amaravathi Reservoir. High utilization of light energy by algae was observed in the three eutrophic ponds, but, as regards fish conversion, the photosynthetically more efficient Ayyankulam pond ranked only next to Fort Moat, Vellore; this may be due to better harvesting and better stocking. There was a glaring contrast among the three upland lakes where a high light conversion efficiency in Ooty Lake and a low efficiency in Kodai Lake reflected the trophic status of the two cold-water, mountain lakes. Yercaud Lake showed a fairly high conversion. (See also W73-10895) (Jones-Wisconsin)
W73-10915

BASE FOR A MODEL OF THE SLAPY RESERVOIR ECOSYSTEM,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 529-540. 1972. 7 fig, 1 tab, 10 ref.

Descriptors: *Systems analysis, *Reservoirs, *Basic data collections, *Methodology, *Productivity, Solar radiation, Ecosystems, Evaporation, Temperature, Dissolved oxygen, Mixing, Phytoplankton.
Identifiers: *Slapy Reservoir (Czechoslovakia), Energy flow diagram, Annual cycles.

Two basic approaches dominate the present limnological work: the direct observations of aquatic ecosystems under different climatic conditions and effects of man, and an experimental laboratory analysis of interactions of selected factors and biota. A third approach is represented by natural experiments, in which the complexity of the interrelations is retained, and reaction on changing one or more variables is studied, thereby conclusive results concerning the effect of the changed variables can be achieved under favorable conditions. The third group models, 'precise models,' closest to field limnologists' thinking, represent the obvious next step of evaluation with quantitative data. A mathematical expression of the empirical deterministic relations between variables proves useful for predicting water conditions. Studies of Slapy Reservoir thermics show it as a dynamic system sensitive to changing discharges and inflow temperatures. The method is applied to the whole ecosystem. It is evident that a distinction of the characteristic annual cycles and correlation of the extreme values is a useful tool for studying the character of the dominant interrelations. In combination with approximation of the curves by harmonic analysis, prediction of the annual course during different conditions is obtained. Character and explanation of relations found represents a basis for modeling the Slapy Reservoir ecosystem. (See also W73-10895) (Jones-Wisconsin)
W73-10916

RESULTS OF THE STUDY OF SOME LINKS OF THE FOOD CHAIN IN A CARP POND IN CZECHOSLOVAKIA,
Karlova Universita, Prague (Czechoslovakia). Dept. of Hydrobiology.
V. Korinek.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 541-553. 1972. 5 fig, 10 tab, 24 ref.

Descriptors: *Productivity, *Food chains, *Ponds, *Energy transfer, *Trophic level, Carp, Nitrogen, Seston, Density, Standing crops, Phytoplankton, Zooplankton, Fish harvest, Organic matter.
Identifiers: *Czechoslovakia.

Results are given of the production study carried out on the carp pond Smyslov (southern Bohemia, Czechoslovakia) during the years 1965 to 1967. The standing crop of the bottom fauna and the zooplankton as well as the amount of nutrients have been measured since 1955 in this pond. Basic characteristics of the water--phytoplankton, zooplankton, fish, and comparison of trophic levels--are discussed. Content of Kjeldahl nitrogen in water and seston was measured. Density, standing crop and gross production of phytoplankton and zooplankton were measured and related to fish yield. Testing the distribution of measured values of the gross phytoplankton production, the hypothesis of the log-normal distribution cannot be refuted and yearly geometrical means were calculated. The most important group of the zooplankton from the production aspect in the pond were Cladocera. The changes in their density are shown. The dominant species were Daphnia pulicaria and Daphnia hyalina. The net efficiency of the energy transfer from phytoplankton to Daphnia was in the range from 9 to 52% and that from phytoplankton to fish between 2 and 13%. The efficiency values are also discussed. (See also W73-10895) (Jones-Wisconsin)
W73-10917

SOME OBSERVATIONS ON PRIMARY AND FISH PRODUCTION IN EXPERIMENTAL FISH PONDS IN MALACCA, MALAYSIA,
Fish Culture Research Training Inst., Malacca (Malaysia).
G. A. Prowse.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 555-561. 1972. 4 tab, 3 ref.

Descriptors: *Productivity, *Primary productivity, *Energy conversion, *Ponds, Fish stocking, Fish harvest, Photosynthesis, Fertilization, Solar radiation.
Identifiers: *Malacca (Malaysia), Autoshading.

Five ponds used for experimental stocking were studied and primary production measurements conducted at four weekly intervals. The ponds were stocked mainly with Tilapia, and algal feeder, with fewer grass carp, Ctenopharyngodon idellus and Puntius gonionotus. For estimating the fish production, the ponds were completely fished and drained and the increment of weight taken as the measure of productivity. Calculations of photosynthetic efficiencies ranged from 7.04 to 3.98%. Calculations of energy conversion from primary to fish production gave efficiencies of 1.02 to 1.79%. High protein pelleted foods give a conversion efficiency of 6%. The conversion efficiencies of 1.02 to 1.79% may seem low, but even the best of protein pelleted foods only give a conversion efficiency of about 6% when calculated as energy. The depth-productivity profiles show clearly the effect of autoshading and the rapid productivity decrease in the highly eutrophic conditions. Clearly autoshading and the high respiration of the phytoplankton must set an upper limit to the potential fish productivity under eutrophic conditions, and this has been found to be so in practice. (See also W73-10895) (Jones-Wisconsin)
W73-10918

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INTENSIFICATION OF FISH PONDS PRODUCTION,
Instytut Rybactwa Srodladowego, Zabieniec (Poland). Dept. of Fish Culture.
P. Wolny, and E. Grygierek.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 563-571. 1972. 8 fig, 4 tab, 4 ref.

Descriptors: *Primary productivity, *Fish harvest, *Fish food organisms, *Productivity, Fertilization, Trophic level, Temperature, Phytoplankton, Zooplankton, Benthic fauna, Carp, Biomass, Photosynthesis.
Identifiers: Phytophagous fish.

Fish production depends on the total productivity, thus observations were made on variations in the qualitative occurrence of organisms from different trophic levels, under various environmental conditions (different fertilization, different stock density, carp monoculture, polyculture, and phytophagous fish). The investigations were conducted at the Department of Fish Culture, Zabieniec, Poland; ponds were stocked with fish larvae. A clear positive correlation between temperature and fish growth was found. Mineral fertilization, increase of stock density, and introduction of phytophagous fish are important factors in intensifying fish production; when these were applied great increases of primary as well as secondary production were observed. The coefficient of correlation between primary production and fish production was estimated to be 0.98. Good results were obtained with double stock density of common carp but the best were in ponds with polyculture of common carp and phytophagous fish. The percentage relation between zooplankton and phytoplankton was inverse; no correlation was observed between fish and zooplankton. Although fish production in ponds with phytophagous fish was greater, the ecological efficiency of production uptake by fish was no greater; introduction of these fish is profitable not for an increase of ecological efficiency but for the general increase of pond productivity. (See also W73-10895) (Auen-Wisconsin)
W73-10919

PRODUCTIVITY AND ENERGY FLOW AT ALL TROPHIC LEVELS IN THE RIVER THAMES, ENGLAND,
Beford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
K. H. Mann, R. H. Britton, A. Kowalczewski, T. J. Lack, and C. P. Mathews.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 579-596. 1972. 3 fig, 5 tab, 29 ref.

Descriptors: *Productivity, *Energy conversion, *Trophic level, *Energy budget, Photosynthesis, Respiration, Fish populations, Crustaceans, Rotifers, Detritus, Insects, Decomposing organic matter, Physical properties, Algae, Phytoplankton, Oxygen, Aquatic plants, Leaves, Benthic fauna, Primary production, Fish food organisms, Fry, Plankton, Energy transfer.
Identifiers: *River Thames (England), River Kennet (England).

Physical measurements, algal populations, phytoplankton biomass, oxygen consumption, planktonic primary production, macrophyte production, production by benthic animals, fish populations, estimation of the partitioning of the energy uptake of roach and bleak, and decomposition are given for the Thames River. Productivity and energy flow have been studied at all trophic levels in the river, a lowland river engineered for navigation and carrying considerable quantities of treated sewage effluent. The most abundant fish were roach (Rutilus rutilus) and bleak (Alburnus alburnus). Figures given for net production represent total photosynthesis less the respiration of the plants and the respiration of the heterotrophs, particularly bacteria and represent a net gain of calories to the community during a 24-hour period. The figures from direct estimates of production by browsers and grazers below the Kennet River mouth are almost exactly those obtained by back-calculation from the food requirements of fish. The very high population densities and production rates of young fish have only recently been determined and greatly modify earlier estimates of total fish production. (See also W73-10895) (Jones-Wisconsin)
W73-10920

THE CHALK-STREAM ECOSYSTEM,
Freshwater Biological Association, Wareham (England). River Lab.
D. F. Westlake, H. Casey, H. Dawson, M. Ladle, and R. H. K. Mann.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 615-635, 1972. 5 fig, 4 tab, 40 ref.

Descriptors: *Productivity, *Streams, *Ecosystems, *Calcareous soils, *Primary production, Physicochemical properties, Energy budget, Biomass, Organic matter, Aquatic plants, Algae, Invertebrates, Fish populations, Detritus, Suspended load, Solar radiation, Leaves, Temperature, Predation, Respiration.
Identifiers: *Chalk-streams, Southern England, River Frome (England), Bere Stream (England), Self-shading.

The typical chalk-stream results from a particular combination of geology, plant and animal species and human management found in Southern England. Research on a range of chalk-streams, especially a stretch of the Bere Stream and the larger River Frome, details the physical and biotic factors affecting production. Accounts are given of the composition, biomass, and production of the communities of higher plants, algae, invertebrates and fish, and of the throughput and deposition of fine detritus. Available data on the biomass and production of the communities at Bere Heath are summarized. The most striking feature is the vast quantity of energy present in the form of detritus, which approaches the magnitude of the useful solar energy input and is probably more than an order of magnitude larger than the invertebrate food requirements. The main uncertainties in the estimates of primary production are algal production, the P/B ratio for emergent plants and the allowances made for the biomass in reaches not studied. Since most of the chemicals in solution show little seasonal variation, and appear to exceed the requirements of the communities, the major factors controlling production are physical and biotic. (See also W73-10895) (Jones-Wisconsin)
W73-10921

PHYTOPLANKTON PRODUCTION, CHEMICAL AND PHYSICAL CONDITIONS IN LOCH LEVEN,
Nature Conservancy, Edinburgh (Scotland); and Freshwater Fisheries Lab., Pitlochry (Scotland).
M. E. Bindloss, A. V. Holden, A. E. Bailey-Watts, and I. R. Smith.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 639-659, 1972. 6 fig, 5 tab, 19 ref.

Descriptors: *Phytoplankton, *Productivity, *Chemical properties, *Physical properties, Temperature, Circulation, Solar radiation, Energy budget, Nitrogen, Phosphorus, Algae, Photosynthesis, Primary production, Benthic flora, Diatoms, Plankton, Water balance, Energy balance, Chlorophyll, Nutrients, Silicates, Respiration.
Identifiers: *Loch Leven (Scotland), Self-shading.

Throughout the year Loch Leven (Scotland) shows large crops of planktonic algae which are considered the main contribution to the lake's primary production. Although macrophytes are sparse, considerable quantities of benthic algae, mainly diatoms, but including some blue-green and flagellate algae, develop as attached and motile communities in this shallow water. Studies on species composition, seasonal succession and spatial distribution of the benthic algae are being started. Loch temperature, water balance, loch circulation, radiation and energy balance are described. Chemical studies have concentrated on the input and loss of nitrogen and phosphorus through the loch. More than 200 planktonic algal species are recorded. Predominance of 'nano' algae and small cells of other species is an interesting general feature, associated with apparent absence of filter-feeding herbivorous crustaceans, although other algal-feeding plankters are often abundant. The complexity of the chlorophyll-a increase during the first half of the year is seen when the succession of constitutuent algal species is considered. The self-shading effect tends to stabilize euphotic populations below one square meter and to oppose somewhat expected increase in productivity with increasing standing crop. (See also W73-10895) (Jones-Wisconsin)
W73-10922

PRIMARY PRODUCTION OF A MONTANE RIVER,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
M. Bombowna.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 661-671, 1972. 8 fig, 7 tab, 8 ref.

Descriptors: *Testing procedure, *Primary productivity, *Mountains, *Rivers, Oxygen, Algae, Chlorophyll, Conductivity, Photosynthesis, Temperature, River flow, Diatoms, Solar radiation, Water level fluctuations, Energy conversion.
Identifiers: *Attached algae, *Montane river, River Raba (Poland).

The primary production of the Polish montane River Raba was measured using several techniques. Results of primary production measurements of attached algae and seston by the C-14 method at very low water levels are given. Measurements of oxygen fluctuations in 24-hour cycles were made at varying water levels and varying rapidity of water currents. Air and water temperature and electric conductivity were measured simultaneously. Primary production is in inverse ratio to water level and discharge volume. Succession of predominant microphytes in different seasons affects primary production although that dependence is often obliterated by water level fluctuations. The amount of primary production of attached algae depends considerably on growth of communities on stones and it fluctuates throughout the river, being higher in the upper section's stony bottoms than in the lower section's sandy bottom. Chlorophyll content is a good index of productivity of a river of this type. Primary production estimates in rapid currents cannot be made by measuring the oxygen content. The method of artificial substrata fixed periodically proved most useful for investigations on the fluctuations of primary production of attached algae. (See also W73-10895) (Jones-Wisconsin)
W73-10923

OBSERVATIONS ON PRIMARY PRODUCTION OF PHYTOPLANKTON IN TWO FISH PONDS,
Karlova Universita, Prague (Czechoslovakia). Dept. of Hydrobiology.
J. Fott.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 673-683, 1972. 7 fig, 2 tab, 14 ref.

Descriptors: *Ponds, *Primary productivity, *Phytoplankton, *Fish farming, Algae, Oxygen, Respiration, Carp, Chlorophyll, Light penetration, Photometry, Photosynthesis, Light intensity.
Identifiers: *Carp ponds, Czechoslovakia.

Meausrement of primary production of phytoplankton in two Czechoslovakian carp ponds were carried out from spring to autumn and the data analyzed from two standpoints: comparison of data obtained by the oxygen and C-14 methods and comparison of primary production and respiration of the plankton. Ratio of the net oxygen production to the assimilated carbon was 0.9 : 1.2 in the upper part of the photic zone. In studies comparing oxygen production in algae with carbon uptake determined by C-14 technique, corrections by arbitrary photosynthetic quotients were avoided. Comparison of the methods is expressed as quotients which are calculated from the values actually measured; the compared methods were in mutual agreement. When phytoplankton was abundant respiration in the light part of day was about 10% of maximum gross production (values per unit volume compared). Net production of planktonic algae per 24 hours per unit surface area was estimated as 55% to 80% of gross production in a small shallow pond. The percentage was stable during three months of a phytoplankton bloom. (See also W73-10895) (Jones-Wisconsin)
W73-10924

PHOTOSYNTHETIC PRODUCTIVITY IN THE AJWA RESERVOIR AT BARODA, WEST INDIA,
Maharaja Sayajirao Univ. of Baroda (India). Dept. of Biochemistry.
S. V. Ganapati, and C. H. Pathak.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 685-692, 1972. 7 tab, 7 ref.

Descriptors: *Photosynthesis, *Productivity, *Reservoirs, Thermal stratification, Energy conversion, Oxygen, Respiration, Physicochemical properties, Dissolved oxygen, Solar radiation, Aquatic plants.
Identifiers: *Ajwa Reservoir (India), *Baroda (West India).

Study of the limnological productivity in the Ajwa Reservoir near Baroda (West India) was conducted in 1963 and 1964. A survey of physicochemical, bacteriological and biological conditions of surface water was undertaken once a month. There was no permanent thermal stratification for any period but it was diurnal in character. In 1963, gross oxygen production varied between 0.42 and 7.64 g/sq m/day and in 1964 between 0.45 and 1.57 g/sq m/day, the annual averages being 3.36 and 0.84 g/sq m/day, respectively. Net oxygen production was found to vary between 0 and 2.06 g oxygen/sq m/day in 1963 and between 0.01 and 0.44 g oxygen/sq m/day in 1964. The annual average ratio of 24-hour respiration to gross production was found to be 79.2% in 1963 and 76.6% in 1964. The annual average photosynthetic efficiency was 0.63% in 1963 and 0.18% in 1964. These values are compared with those of a few temperate and tropical waters. (See also W73-10895) (Jones-Wisconsin)
W73-10925

THE REGULATION OF NET PRIMARY PRODUCTION IN LAKE GEORGE, UGANDA, EAST AFRICA,
Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
G. G. Ganf.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 693-708, 1972. 9 fig, 3 tab, 12 ref.

Descriptors: *Primary productivity, *Energy conversion, Phytoplankton, Photosynthesis, Respiration, Tropical regions, Biological communities, Bicarbonates, Ions, Oxygen, Growth rates, Nutrients, Light penetration, Cyanophyta, Diatoms, Chlorophyta, Chlorophyll, Solar radiation, Stratification, Temperature.
Identifiers: *Lake George (Uganda), Self-shading.

Phytoplankton is the major source of primary production through direct conversion of solar to chemical energy during photosynthesis in Lake George, western Uganda. The gross photosynthetic rates are high, while net production is relatively low, because most carbon fixed is rapidly recycled via the respiratory cycle. The factors which govern respiratory rates and photosynthetic rates are, therefore, those which regulate net production. The major ecological factors governing photosynthetic rates are light, temperature, and the nutrient balance of the ecosystem. As the light and temperature characteristics of Lake George show little seasonal fluctuation, it may be assumed that they have a fairly constant effect upon the phytoplankton community. Therefore, changes in community density may be attributed to fluctuations in nutrient status or to variations in efficiency of the photosynthetic system. Given a relatively stable environment, the factors which tend to minimize change in the community become important. These factors are manifold but the self-regulation and low magnitude of the net production allows this algal community to maintain itself without radically changing the ecological template or over-exploiting the available nutrients. In this way, the violent populations fluctuations, common in temperate waters, are avoided. (See also W73-10895) (Jones-Wisconsin)
W73-10926

COMPARATIVE TRENDS OF PRIMARY PRODUCTIVITY AND SOME CHEMICAL PARAMETERS IN LAKE MAGGIORE ON A PLURIANNUAL BASIS,
Istituto Italino di Idrobiologia, Pallanza (Italy).
M. Gerletti.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 709-713, 1972. 3 fig, 13 ref.

Descriptors: *Primary productivity, *Water chemistry, Trophic level, Energy conversion, Solar radiation, Photosynthesis, Nutrients, Eutrophication, Conductivity, Nitrates, Phosphorus.
Identifiers: *Lake Maggiore (Italy).

Annual primary production is computed for Lake Maggiore using 14 series presented by Vollenweider (1959-60) and 14 series by Goldman, et al. (1965), all obtained by the C-14 method, using a mean photosynthetic efficiency computed for each group and records of solar radiation of the meteorological observatory. The increase of production is supported by examination of depth profiles of production from surface to 30 meters obtained in Lake Maggiore in successive years. Data show a quite steady increase in electric conductivity and nitrate nitrogen content during the last eleven years. Increase in nutrients must be attributed to human domestic pollution mainly and to a limited amount of industrial pollution. The increased, unevenly distributed human population implies a faster and more complete flow of nutrients into lake waters through the numicipal sewage systems, hitherto not equipped with treatment plants. The most probable source of phosphorus increase is the recent introduction of synthetic detergents. Other observations support a trend towards a situation of 'cultural' eutrophication. In the last ten years recurrently dense Tabellaria populations sometimes reached the bloom stage. In autumn 1967 for the first time Ocillatoria rubescens produced a bloom. (See also W73-10895) (Jones-Wisconsin)
W73-10927

THE PRIMARY PRODUCTIVITY OF A FISH--POND AT ILE-IFE, NIGERIA,
Ife Univ. (Nigeria). Dept. of Biological Sciences; and Eotvos Lorand Univ., Budapest (Hungary). Chair of Plant Physiology.
A. M. Imevbore, G. Meszes, and Z. Boszormenyi.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problesm of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 715-723, 1972. 4 fig, 3 tab, 7 ref.

Descriptors: *Primary productivity, *Fish farming, *Ponds, Phytoplankton, Nutrients, Algae, Photosynthesis, Physical properties, Meteorological data, Tropical regions, Chemical properties, Seasonal, Light penetration, Energy conversion, Biomass, Light intensity, Limiting factors.
Identifiers: *Ile-Ife (Nigeria), Kainji Lake (Nigeria), Fish pond.

Algal photosynthetic activity and productivity studies of West African fresh waters using the C1-4 technique were undertaken in a small fish-pond, while parallel observations were conducted in the Kainji Reservoir. Meteorological data for the area are given. Data obtained for photosynthetic production under natural conditions reflect the combined action of changes in intensity of underwater light penetration and changes in the quantity (activity) of phytoplankton. The low production value obtained in the field in June was not caused by low plankton quantity and activity but rather by low light intensity. High production values between February and June in both natural and artificial conditions were due to both high plankton activity and favorable light. In corollary, generally lower production values during the July-December months, even under artificial illumination, must be attributed to lower plankton activity. Higher production values in the afternoon than in the morning indicate both a circadian rhythm in the phytoplankton and a generally stronger light intensity in the afternoon. In summary, it seems that nutrients limit primary productivity most of the year, but, occasionally light penetration is also limiting. These data are in the range found by Talling (1965) for productivity of East African lakes. (See also W73-10895) (Jones-Wisconsin)
W73-10928

COMPARISON OF SOME METHODS OF DETERMINING THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
S. Wrobel.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 733-737, 1972. 3 fig, 2 tab, 5 ref.

Descriptors: *Testing procedures, *Primary productivity, *Phytoplankton, *Ponds, Analytical techniques, Chlorophyll, Productivity, Gas chromatography, Eutrophication, Measurement.
Identifiers: Golysz (Poland), Oxygen exchange method, Oxygen method, C-14 method.

Measurement of the primary production of phytoplankton in ponds at Experimental Fishery Farms, Golysz, Poland, were made by several methods. The light and dark bottle method was compared with the C-14 method and with the method of oxygen exchange between water and air. In the two experimental ponds the Cyanophyceae species pervailed with a predominance of Microcystis aeruginosa, while in another pond Volvox aureus prevailed. The small number of experiments does not permit drawing any detailed conclusions. It is certain, however, that the value of total production calculated by the oxygen method in eutrophic waters is 15-20% lower than in actuality; for the value of net production the difference would probably be twice

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as great. However, comparing these methods, very similar results of the total production measured by the oxygen method and the C-14 method as well as of the net production estimated by the oxygen method and the gas exchange method are obtained. In highly eutrophic water basins the use of oxygen method is limited. It is concluded that in waters belonging to the extreme types, primary production may be measured only by the C-14 method. (See also W73-10895) (Jones-Wisconsin)
W73-10929

THE EXTENT OF CONSUMPTION OF THE ENERGY CONTAINED IN THE FOOD SUSPENSION OF CERIODAPHNIA RETICULATA (JURINE),
Bailystok Medical Academy (Poland). Dept. of Biology.
B. Czeczuga, and E. Bobiatynska-Ksok.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 739-748, 1972. 5 fig, 2 tab, 36 ref.

Descriptors: *Productivity, *Energy conversion, *Nutrient requirements, *Crustaceans, Energy transfer, Respiration, Food chains, Metabolism, Animal growth, Reproduction, Algae.
Identifiers: *Ceriodaphnia reticulata, Energy assimilation.

The importance of determining the energy metabolism of Ceriodaphnia is based on its importance as food in the early stages of fry development of various fish species. The number of the algal cells consumed was calculated from the differences in suspension concentrations. The algae used were Chlamydomonas nivalis, Chlorella elipsoidea, Chlorella vulgaris, Ankistrodesmus falcatus var. duplex, and Scenedesmus obliquus. C. reticulata specimens were divided into three groups: small, medium, and large, mature. Twenty small, 10 middle-sized and 10 large specimens were placed in 20 ml of suspension. Number of cells consumed was calculated from the differences in the suspension concentrations by means of a Burker camera. The caloric value of the various algal species and in the size groups of C. reticulata was determined by means of a calorimetric microbomb. Respiration intensity was determined by Warburg apparatus. Ratio of number of calories taken in with food, burnt during respiration, assimilated with food, to number of calories contained in the food suspension, percent of consumption of reserves in food suspension and coefficient K-1 and K-2 for each growth group of C. reticulata fed with different algal species were recorded. (See also W73-10895) (Jones-Wisconsin)
W73-10930

COMPARISON OF THE PHYSICAL AND CHEMCIAL ENVIRONMENTS OF VOLTA LAKE AND LAKE NASSER,
Lake Nasser Development Centre, Aswan (Egypt).
B. Entz.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 883-891, 1972. 1 fig, 6 tab, 2 ref.

Descriptors: *Lakes, *Physical properties, *Chemical properties, *Africa, Eutrophication, Oligotrophy, Turbidity, Tropical regions, Productivity, Phytoplankton, Oxygen, Hydrogen ion concentration, Nutrients, Temperature, Winds, Bottom sediments.
Identifiers: *Volta Lake (Africa), *Lake Nasser (Egypt).

Comparison is made of some limnological conditions in two recently created African lakes: Volta Lake, oligotrophic, is entirely within the tropics, while Lake Nasser, eutrophic, has tropical and subtropical sections. In Volta Lake, Microcystis water-blooms developed shortly after the floods; in Lake Nasser a strong 'water coloration' appeared in the second half of the flood season, caused mainly by Volvox. The level of oxygen saturation in Volta Lake is mainly influenced by the wind. The bottom is covered with decomposing trees, bushes, grass, or soil with high organic matter content, and there is a still continuing oxygen reduction taking place in the water mass. Oxygenation through the surface is the main source of dissolved oxygen. In Lake Nasser the oxygen situation is quite different: during winter and spring months oxygen concentrations near the surface were as high as 110-160% of the saturation level caused by a high photosynthetic rate. Wind is a much more important temperature regulating factor than it is on Volta Lake. The richness of Lake Nasser, a cause of intensive photosynthesis, is responsible for pH levels which are much higher than thos in Volta Lake. (See also W73-10895) (Jones-Wisconsin)
W73-10931

SOME CHARACTERISTICS OF A SHALLOW ENDORHEIC LAKE IN ITS DRYING PHASE AND ITS REVOVERY PHASE. LAKE CHILWA (MALAWI),
Malawi Univ., Limbe.
N. P. Mwanza.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 897-900, 1972. 6 ref.

Descriptors: *Lakes, *Shallow water, *Dry beds, Tropical regions, Saline water, Biological communities, Conductivity, Phytoplankton, Zooplankton, Fish, Alkalinity, Algae, Bacteria, Invertebrates.
Identifiers: *Lake Chilwa (Malawi).

Lake Chilwa, Malawi, Africa, is a shallow tropical lake which undergoes drying and flood conditions. During dry years, life all but disappears, but during recovery biological communities reappear. This is summarized in context of the salinity changes. The changing salt content seems to be due only to dilution and evaporation. Quantitative studies of bacterial populations during the drying phase show lower counts when salinity and alkalinity have risen, and higher counts during recovery. Algal studies during the two phases show considerable changes in abundance and type. During the drying phase the flora consists of only a few species of Cyanophyta and diatoms. The recovery phase was characterized by the development of a more diverse flora with many algae of Chlorophyta and Chrysophyta species. The Chlorophyta include many Volvocales which cover the water surface with a more or less continuous green sheet. During the drying phase observations of zooplankton abundance and breeding were noted, while in the recovery phase intensive studies of horizontal distribution of species in open water, bay and marshes and of quantitative composition, periodicity, and cyclomorphosis are being made. There are three species of commercially important fish. During recovery phase a program of restocking with the endemic Tilapia species was initiated. (See also W73-10895) (Jones-Wisconsin)
W73-10932

ON THE QUALITATIVE CHARACTERISTICS OF THE PHYTOPLANKTON OF THE NATRON ('SZIK') PONDS OF HUNGARY,
Damjanich Muzeum, Szolnok (Hungary). Laboratorium Tisza-Forsch.
G. Uherkovich.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 913-918, 1972. 3 fig. 9 ref.

Descriptors: *Phytoplankton, *Ponds, Saline water, Cyanophyta, Indicators, Diatoms, Carbonates, Bicarbonates, Hydrogen ion concentration, Biological communities, Scenedesmus, Water chemistry.
Identifiers: *Natron ponds, *Hungary.

In contrast to salt lakes characterized by their considerable sodium chloride concentrations, lakes with higher concentrations of sodium carbonate and sodium bicarbonate-natron lakes are comparatively rare. A number of natron ponds are present in the region between the rivers Danube and Tisza (Hungary) in deflated depressions and also east of the River Tisza in dried-out riverbeds. Quantitative composition of the cenoses is a more revealing indicator of their salt water character than mere qualitative description, as they are composed of 55.5% salt water on the average. The great variation of phytoplankton cenoses is shown in the profound changes which may occur in a very short time. Cenoses of phytoplankton with the largest populations are invariably composed of representatives of salt water organisms in proportions greater than 90%. The most numerous cenoses are usually caused by the multiplication of one or two Cyanophyta organisms (like Dactylococcopsis rupestris, Phormidium fragile, Gomphosphaeria aponina, Lyngbya limnetica). Presence of certain salinity-indicator organisms of the Bacillariophyceae species is usually typical of these cenoses. (See also W73-10895) (Jones-Wisconsin)
W73-10933

THE BOTTOM FAUNA IN AN OIL-CONTAMINATED LAKE,
Lund Univ. (Sweden). Limnological Inst.
L. Bengtsson, and H. Berggren.
Ambio, Vol 1, No 4, p 141-144, 1972. 3 fig, 2 tab, 17 ref.

Descriptors: *Benthic fauna, *Lakes, *Oil pollution, Water pollution effects, Bottom sediments, Biological communities, Urban runoff, Sampling, Rehabilitation, Hypolimnion, Aeration, Spectrophotometry, Oligochaetes, Diptera, Tubificids, Toxicity.
Identifiers: *Lake restoration, Jarla Lake (Sweden), Industrial runoff.

Results of analyses of bottom sediment samples from Jarla Lake, Sweden, showed that the oil content increases towards the bay where the main runoff water outlets are situated. Lack of macrobenthos at lower depths and improverished bottom fauna indicate a very strong influence of the oil and oil derivatives in the waste water runoff. The oil content of sediment can affect the organisms mechanically and physiologically and may also be toxic. Normally macrobenthos consume fresh settled material, older sediment material, build tubes in the sediment and pump oxygen-rich water through these, aerate the sediment surface by their respiratory movement, move sediment--which is altered during passage through the intestinal cannal--from beneath to the sediment surface and make it available for aerobic microbial decomposition. Their fish predators mix the surface of the sediment in attempting to catch them. Studies have been concentrated on different methods of reducing oil content in waste water and on the effects of oil on the efficiency of sewage plants. Large quantities of oil enter receiving water with runoff water which originates from filling stations, industrial areas and roads. (Jones-Wisconsin)
W73-10934

ECOSYSTEM STUDIES IN CONNECTION WITH THE RESTORATION OF LAKES,
Lund Univ. (Sweden). Limnological Inst.
L. Bengtsson.
Verhandlungen der Internationalen Vereiningung fur Theoretische und Angewandte Limnologie, Vol 18, p 379-387, 1972. 7 fig, 2 tab, 6 ref.

Descriptors: *Ecosystems, *Lakes, *Rehabilitation, *Water pollution treatment, Eutrophication, Projects, Biological communities, Aquatic plants, Sediments, Water levels.
Identifiers: *Lake restoration, Lake Trummen (Sweden), Lake Hornborga (Sweden).

The lake restoration research program at the University of Lund, Sweden, is an interdisciplinary ecological as well as an ecological-technical collaboration to study principles for solution of severe environmental problems caused by man, restoration of some especially valuable lakes, to train ecologists for solving problems in applied water management, and to gain knowledge in theoretical ecology. The two lakes considered were Trummen and Horborga; results are presented. In Lake Trummen, by means of a suction dredger 1 m sediment is pumped from the lake onto the land, 0.5 m in 1970 and another 0.5 in 1971. Altogether 600,000 cu m gyttja and 300,000 cu m lake water were pumped to settling ponds. From these the mixture of lake and interstitial runoff water is treated with aluminum sulphate before returning to lake Trummen. Through the restoration the water volume increases about 70%. Lake Hornborga, which had been unsuccessfully lowered to gain arable land, had been considered an important Western Eutropean waterfowl refuge. In considering the raising of the water level for restoration, the accumulated masses of coarse Phragmites detritus had to be reduced and primary production redistributed. Although the projects had not been completed, improvements are evident. (Jones-Wisconsin)
W73-10935

THE GENETICS OF BLUE-GREEN ALGAE,
University Coll., Galway (Ireland). Dept. of Microbiology.
J. A. Houghton.
Science Progress, Oxford, Vol 60, No 239, p 407-412, 1972. 51 ref.

Descriptors: *Genetics, *Cyanophyta, *Algae, Phyllogeny, Cytological studies, Metabolism, Reproduction, Reviews.

The phyllogenetic position of blue-green algae is still speculative and a comparison of the gentic system of blue-green algae and those of bacteria and other algae might provide very useful information, especially for their economic exploitation. An attempt is made to clarify present knowledge of their genetics. Until recently, blue-green algae were regarded as reproducing primarily by binary fission. Much of the genetic work published to date has been concerned with induction of mutants, recombination studies, and genetic mapping. Bazin showed quite conclusively that genetic recombination could occur in Anacystis nidulans. The results indicated that genetic transfer followed by recombination was taking place between two strains, providing clear evidence for sexuality, and thus making genetic mapping more feasible. Some spontaneous mutants, for example mutations affecting cell division, have been isolated but most recent techniques have involved use of chemical mutagens. Ultraviolent light has also been used in the isolation of mutants from Anabaena doliolum and A. cycadeae. A temporal genetic map of six cistron has been prepared. Other approaches to genetic mapping are the use of genetic transformation and use of transduction; blue-green algal viruses have been isolated which make the latter technique feasible. (Jones-Wisconsin)
W73-10938

RELEASE OF AMMONIUM-N FROM SEDIMENTS TO WATERS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-10939

COMPLEXING PROPERTIES OF NITRILOTRIACETIC ACID IN THE LAKE ENVIRONMENT,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
Y. K. Chau, and M. T. Shiomi.
Water Air Soil Pollut. Vol 1, No 2, p 149-164, 1972. Illus.
Identifiers: Acetic-Acid, Cadmium, Copper, Environment, Lakes, Mercury, Nickel, *Nitrilotriacetic acid.

Recent proposals to limit the phosphate content of detergents have prompted the detergent industry to investigate possible phosphate substitutes. The trisodium salt of nitrilotriacetic acid (NTA) was one of the most promising compounds proposed. At concentrations above 1 ppm NTA can react with sparingly soluble compounds to release the metal and associated anions through complexation. It also interacts with sediment to release certain metals depending on the abundance of the metals in the sediment. In situ and laboratory experiments were carried out to study such interactions and also to follow the fate of these released metals after NTA has degraded. Degradation of certain NTA-metal complexes in lake water medium was also studied. Certain NTA complexes (Cu, Ni, Cd, Hg) were very resistant to degradation.--Copyright 1972, Biological Abstracts, Inc.
W73-10942

THE EFFECT OF NUTRIENT FERTILIZATION ON THE BENTHIC ALGA ULVA LACTUCA,
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.
T. Waite, and R. Mitchell.
Botanica Marina, Vol 15, No 3, p 151-156, 1972. 4 fig, 20 ref.

Descriptors: *Productivity, *Estuaries, *Fertilization, *Benthic flora, Marine algae, Nutrients, Biomass, Plant growth, Massachusetts, Ammonia, Phosphates, Carbon fixation, Photosynthesis, Enzymes, Nitrogen, Mathematical models, Coasts, Eutrophication, Sea water, Limiting factors.
Identifiers: *Ulva lactuca, Nahant (Mass).

Large benthic algal biomass caused by fertilization hinders water movement in shellfish beds, and during degradation, hydrogen sulfide is released. Nutrients which might be 'limiting' to growth of Ulva lactuca at Nahant, Massachusetts, were determined and an algal nutrient response surface showing interaction of two nutrients was constructed. Continuous monitoring gave ammonia nitrogen, nitrate nitrogen, and phosphate phosphorus values. Nitrogen enrichment was made with ammonia nitrogen, the main nitrogen form in domestic sewage, eliminating possibility of the plants' taking up other forms of nitrogen. C-14 incorporation, as a growth parameter, in benthic macrophytes was discussed. Ulva productivity response to phosphate and ammonia enrichments is complex. Ammonia stimulates plant growth at certain concentrations and inhibits productivity at others. Ulva may be stimulated by either ammonia or phosphate, indicating that concept of a 'limiting' nutrient probably is not applicable to define Ulva growth in nature. Productivity was inhibited in ammonia concentrations exceeding 60 micromoles regardless of phosphate concentration. Maximum productivity was observed at ammonia concentration of 43 micromoles and phosphate concentration of 19 micromoles. Baule-Mitcherlich equation is proposed as possible model for nutrient interaction in growth rate determination. (Jones-Wisconsin)
W73-10944

CONTROL OF ALGAE,
Imperial Chemical Industries Ltd., Jealott's Hill (England). Jealott's Hill Research Station.
A. F. Hawkins.
Outlook on Agriculture, Vol 7, No 1, p 21-26, 1973. 2 fig, 1 tab, 40 ref.

Descriptors: *Algal control, *Fungicides, *Algicides, *Herbicides, Nuisance algae, Copper sulfate, Algal toxins, Reservoir design, Turbulence, Diquat, Aquatic weed control, 2-4-D, Dalpon, 2-6-dichlobenil, Irrigation canals, Marine algae, Navigation, Paints, Chlorination, Agronomic crops, Aminotriazole, Urea pesticides, Biocontrol, Rice, Fungicides, Australia.
Identifiers: Anti-fouling paints, Maleic hydrazine, Acrolein, Triazines, Xylol, Phytotoxic oils, Diuron, Holland, Organotin fungicides, Fentin acetate, India, Italy, Philippines.

There is an urgent need for short-term measures to alleviate problems caused by algae. Situations where short-term measures are needed or are in use are discussed. The only compound used in quantity on a world scale is cooper sulfate pentahydrate, which presents no danger to man when used in controlled concentrations. The provision of multiple storage units in pumped storage reservoirs allows them to be taken out of service at times of maximum infestation; similarly, provision of outlets at various levels permits the cleanest water to be drawn off selectively. Future reservoir construction is likely to be designed for maximum depth with minimum surface area--conditions unfavorable for dense algal growths. Another approach is to prevent thermal stratification by installation of pumps. Diquat has been used with success against blooms of blue-green algae in Israel, where algal poisoning is a recurrent problem in small ponds and impoundments. Algae may be resistant to herbicides used for aquatic weed control; in Lake Rotoiti, New Zealand, a heavy infestation of Lagarosiphon major was cleared by diquat, only to be replaced by Nitella. The use and effects of algicides, herbicides, and fungicides in the Netherlands, Australia, United States, and in the Philippines are also described. (Auen-Wisconsin)
W73-10945

POTENTIAL HETEROTROPHY IN A NATURAL POPULATION OF OSCILLATORIA AGARDHII VAR. ISOTHRIX SKUJA,
Michigan Univ., Ann Arbor. Dept. of Zoology.
G. W. Saunders.
Limnology and Oceanography, Vol 17, No 5, p 704-711, 1972. 1 fig, 1 tab, 24 ref.

Descriptors: *Algae, *Metabolism, *Plant populations, *Biochemistry, Cyanophyta, Plant growth, Adsorption, Plant growth substances, Plant physiology.
Identifiers: *Oscillatoria agardhii, Glucose, Acetate, Heterotrophy, Dark.

That some algae can grow in the dark on organic substrates has been demonstrated many times in culture. Substrate concentrations, however, are 1,000 to 100,000 times greater than have been found in uncontaminated waters. The data presented for Oscillatoria agardhii var. isothrix show conclusively that this algae can assimilate glucose in situ in the dark at approximately natural concentrations; it can also assimilate acetate. Three other blue-green algae, Oscillatoria utermoehlii, Oscillatoria sp., and Arthrospira sp., are able to assimilate glucose in the dark and two of these species can also assimilate acetate. They occur maximally in the interphase between aerobic and anaerobic conditions and all extend downward into waters containing hydrogen sulfide. Radioatography of the four species tested gives evidence that they can take up glucose-C14 and acetate-C14 at the low concentrations occurring in lake water. The glucose-C14 uptake kinetics by O. agardhii demonstrated that they are metabolic. The quantitative importance of such uptake in the development of algal populations cannot be assessed from the data but the fact that O. agardhii develops massive densities in the microaerobic

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zone of many lakes suggests that heterotrophy may be very important to it and perhaps to other species occupying this habitat. (Auen-Wisconsin)
W73-10946

'BRINGING SICK LAKES BACK TO HEALTH',
Lund Univ. (Sweden). Limnological Inst.
S. Bjork.
Teknisk Tidskrift, No 11, p 1-7, 1972. 7 fig.

Descriptors: *Eutrophication, *Social aspects, *Water pollution effects, Water levels, Adoption of practices, Costs, Thermal stratification, Oxygenation, Aeration, Water pollution treatment, Drainage programs, Harvesting, Wildlife conservation, Project purposes, Rehabilitation, Water birds, Dredging, Environment.
Identifiers: *Lake restoration, Lake Trummen (Sweden), Lake Jarla (Sweden), Lake Hornborga (Sweden), Water level reduction.

Limnologists and engineers have cooperated to restore three Swedish lakes of different types, each with suitable different treatment methods. In Lake Trummen, the entire cultural sediment layer was removed; since then the oxygen content during winter has been excellent and a good environment has been created for fish. However, the building of a motorway along and across the southern part has been proposed; this would completely ruin the restored environmental unit of the lake and its surroundings. The restoration of Lake Jarlasjon was accomplished by aeration utilizing a method of raising the oxygen content in the hypolimnion without disturbing the thermal stratification. The water level of Hornborgasjon has been lowered on several occasions in unsuccessful attempts to obtain arable land. The draining only transformed the lake into a vast marsh. Hornborgasjon had been considered one of the finest waterfowl lakes in Western Europe and it was invaluable both as a migration resting place and as a nesting site for waterfowl. Before the water level could be raised, the damage caused by drainage had to be repaired. The restoration methods for these projects were developed in large-scale field experiments. (Jones-Wisconsin)
W73-10947

BIBLIOGRAPHY ON THE ECOLOGY AND TAXONOMY OF MARINE ALGAE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. Neushul, and D. Coon.
Available from the National Technical Information Service as COM-72-11426, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Publication No 21, August 1972. 10 p, 86 ref (IMR Reference No 73-1).

Descriptors: *Marine plants, *Bibliographies, *Ecology, *Systematics, Marine algae, Biological communities, Cytological studies, Biochemistry, Phytoplankton, Benthic flora, Oceans.

In this bibliography of 86 citations, dealing with the extent and diversity of marine algae, published in both foreign and English languages, emphasis is placed on taxonomic and, particularly, ecological studies. Citations are divided into those dealing with marine benthic algae and marine phytoplankton. Taxonomic studies usually begin with what has been called alpha taxonomy followed by assessments that can involve cytological, biochemical, numerical and experimental approaches. The spreading, adverse impact of man on world ecosystems makes it imperative that progress is made very rapidly from the first ecological reconnaissance and taxonomic studies through to definitive quantitative ones. One of the most essential tools of the marine ecologist is regional flora. Observations are made on the east and west coasts of the United States. Application of scuba techniques and various methods of sampling in benthic marine habitats are discussed. Autecological studies of benthic marine algae have most frequently emphasized the larger kelps. Of interest are studies of specific oceans, productivity and the growth of marine phytoplankton, populations and general concepts of plankton organization, aspects of physiology and ultrastructure of specific diatoms, chrysophytes in general, and general principles of phytoplankton ecology. (Jones-Wisconsin)
W73-10949

CARBON IN FRESHWATER SYSTEMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel, and P. H. Rich.
1972. 34 P, 5 FIG, 10 REF.

Descriptors: *Carbon, *Freshwater, Carbon dioxide, Photosynthesis, Metabolism, Bicarbonates, Detritus, Productivity, Cycling nutrients, Hydrogen ion concentration, Carbon cycle, Nutrients, Adsorption.
Identifiers: Lawrence Lake (Mich), Carbon flux, Organic carbon, Inorganic carbon.

Evidence is available that among the enormous diversity of concentrations and states of inorganic carbon in freshwaters there exist many situations where free carbon dioxide in equilibrium with the atmosphere may be inadequate for metabolism or indirectly inadequate as a result of chemical losses from the system. Possession of an affinity for bicarbonate is an adaptive advantage in a significant percentage of aquatic life, particularly for larger submersed angiosperms. The organic carbon budgets as given for Lawrence Lake, Michigan, serve as an example to illustrate the various inputs, losses, and utilization relation of organic carbon. The pelagic organic carbon budget indicates losses of DOC considerably exceed inputs resulting in net production of 17 gC/sq m/yr. In contrast, particulate organic carbon production exceeds losses and results in a total organic net production of 3 gC/sq m/yr for the pelagic zone. The importance of the littoral region, not only its contribution to autochthonous production but also its indirect effects on pelagic and benthic carbon metabolism is emphasized. The concept of net ecosystem productivity is reviewed and applied. The relative contributions by differeing modes of metabolism to dissolved and particulate carbon pools is considered. (Jones-Wisconsin)
W73-10950

AQUATIC PLANT CONTROL PROGRAM.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W73-10951

AQUATIC PLANT CONTROL RESEARCH PROJECT PLAN FY 73-77 (PPB REPORT),
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 03B.
W73-10959

ECOLOGY OF VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY,
Georgetown Univ., Washington, D.C. Dept. of Biology.
T. Kaneko, and R. R. Colwell.
Journal of Bacteriology, Vol 113, No 1, p 24-32, January 1973. 3 fig, 5 tab, 35 ref.

Descriptors: *Water analysis, *Zooplankton, Cultures, Water temperature, *Distribution patterns, Sediments, Niches, Seasonal, Marine bacteria, Pathogenic bacteria, Detritus, Separation techniques, Sampling, Population, Biological communities, Path of pollutants, Aquatic populations, Rivers, Estuaries, *Chesapeake Bay.
Identifiers: *Vibrio parahaemolyticus, *Culture media, Water quality requirements, Viable counts, Chitin, Rhode River.

The seasonal incidence of Vibrio parahaemolyticus was studied to determine its ecological niche in the natural environment; its habitat and role in the natural cycles of plankton, water, and sediment; and the mechanisms by which it survives the winter. Samples of sediment, plankton, and water were collected monthly from the Rhode River in Chesapeake Bay. For total viable counts YE and SWYE media were used. Vibrio parahaemolyticus was isolated on TCBS medium. Bacterial counts were made for unfiltered water, filtrates, zooplankton, and sediments. The incidence of Vibrio parahaemolyticus and related vibrios was found to be correlated with water temperature. The vibrios could not be detected in the water column during the winter months, although they were present in sediment. From later spring to early summer, when water temperatures were 14 plus or minus 1 C, vibrios over-wintering in sediment were released from the bottom communities and attached to zooplankton, proliferating as the temperature rose. The number of vibrios in and on plankton was reflected in the water column bacterial population densities at water temperatures of ca. 19 C. Interaction between sediment, water, and zooplankton was essential in the natural estuarine ecosystem. The bacterial population associated with zooplankton was predominantly on external surfaces and was specific, differing from that of the sediment. Vibrio spp. and related organisms comprised the total bacterial population associated with zooplankton in summer months. The ecological role of Vibrio spp., including Vibrio parahaemolyticus, was significant, with respect to their property of chitin digestion and in relation to the population dynamics of zooplankton in Chesapeake Bay. (Little-Battelle)
W73-11001

EDAPHIC FACTORS OVERRIDE A POSSIBLE GRADIENT OF ECOLOGICAL MATURITY INDICES IN A SMALL STREAM,
North Carolina Univ., Chapel Hill. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-11003

DISSOLVED OXYGEN AND TEMPERATURE IN A STRATIFIED LAKE,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-11005

GROWTH OF A FLOATING AQUATIC WEED, SALVINIA UNDER STANDARD CONDITIONS,
Makerere Univ., Kampala (Uganda). Dept. of Botany.
J. J. Gaudet.
Hydrobiologia, Vol 41, No 1, p 77-106, February 28, 1973. 11 fig, 15 tab, 34 ref.

Descriptors: *Aquatic plants, *Floating plants, Ferns, Growth rates, Cultures, Bioassay, Light intensity, Carbon dioxide, Calcium, Strontium, Heavy metals, Nitrogen, Phosphorus, Absorption, Nitrates, Ammonia, Phosphates, Hydrogen ion concentration, Conductance, Dissolved oxygen, Ureas, Sulfates, Iron, Potassium, Sodium, Magnesium, Zinc, Manganese, Cobalt, Molybdenum, Aluminum, Copper, Titanium, Nickel, Chromium, Chlorophyll, Plant pigments, Water analysis, Amino acids, Boron.
Identifiers: *Salvinia molesta, *Salvinia minima, Culture media, C-14, Tin, Alanine, Glutamine, Glutamic acid, Biological samples, Silicon, Scenedesmus species, Synedra, Navicula species, Amphora species, Cymbella, Nitzschia, Surirella, Pediastrum.

Experimental flasks containing basal nutrient medium were inoculated with stock cultures of Salvinia minima or S. molesta and placed in growth chambers for investigation of factors affecting growth rates. Determinations were made of

total nitrogen, pigments, amino acids, trace elements and C-14 uptake in plants and pH, conductance, DO, NO3, urea, ammonium, PO4, SO4, total iron, K, Na, Mg, and Ca in water. The results obtained were as follows: (1) Growth of the floating aquatic weed, Salvinia, in sterile culture was exponential for at least 2 weeks under standardized conditions. (2) Increase in light intensity or in CO2 resulted in increases in growth rate, but did not extend the exponential period of growth. (3) This aquatic plant, like many others, discriminates against calcium relative to strontium. (4) In culture Salvinia exhibited luxury consumption of N and P. (5) Because of high C/N ratios, Salvinia may not be a favorable source of animal food, but might be useful in nutrient removal schemes. (6) In sterile culture, Salvinia molesta produced fewer leaves than Salvinia minima, but maintained a significant increase in leaf area and dry weight. This may be correlated with the ability of the first species to rapidly spread over tropical waterways. (Little-Battelle)
W73-11007

ALGAL RESPONSE TO DETERGENT PHOSPHATE LEVELS,
North Carolina Univ., Chapel Hill. School of Public Health.
D. E. Francisco, and C. M. Weiss.
Journal Water Pollution Control Federation, Vol 45, No 3, p 480-489, March 1973. 5 fig, 7 tab, 15 ref.

Descriptors: *Aquatic algae, *Detergents, *Phosphates, *Bioassay, Waste water (Pollution), Water pollution, *Eutrophication, Nutrients, Plant growth, Sewage treatment, Tertiary treatment, Water sampling, Water analysis, Physicochemical properties, Chlorophyta, Sewage effluents, Biochemical oxygen demand, Carbon, Suspended solids, Nitrates, Nitrites, Ammonia, Alkalinity, Hydrogen ion concentration, Chemical analysis, Aquatic plants, *North Carolina.
Identifiers: *Selenastrum capricornutum, Organic carbon, Kjeldahl nitrogen, Lake Michie, University Lake.

Algal assays were performed on treated wastewaters, some containing phosphate detergents and others containing a non-phosphate detergent. The controls for the bioassay were established using raw wastewater. Each test and control culture was prepared in triplicate, with a total volume of 100 ml in a flask seeded with 1000 cells/ml of the test alga, Selenastrum capricornutum. The flasks were capped loosely with aluminum foil, incubated at 24 C under 400 ft-c of cool-white fluorescent illumination, and swirled once daily. Growth response of the test alga was determined at 3, 5, 7, 10, and 14 days by hemocytometer counting. For growth comparison, the standard algal assay medium (NAAM) was used. In general, phosphate detergent wastewater allowed the same growth as did non-phosphate detergent wastewater at each level of treatment. Tertiary treatment for phosphorus removal resulted in much less growth than secondary treatment. Tertiary-treated phosphorus detergent wastewater allowed significantly greater growth than the non-phosphorus wastewater at a concentration of 2 percent. Simply removing detergent phosphates from wastewater apparently will not control eutrophication, except where the receiving water is very strongly phosphorus-limited and wastewater is the principal phosphorus source, but may allow significantly better tertiary phosphorus removals. (Holoman-Battelle)
W73-11008

A ZOOGLOEA BACTERIUM WITH GELATINOUS MUCOPOLYSACCHARIDE MATRIX,
Tokyo Metropolitan Univ. (Japan). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-11009

ENTERIC VIRUS SURVIVAL IN ALGAL-BACTERIAL WASTEWATER TREATMENT SYSTEMS-I. LABORATORY STUDIES,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 05D.
W73-11010

THE REACTIONS OF ROACH (RUTILUS RUTILUS (L.)) TO CHANGES IN THE CONCENTRATION OF DISSOLVED OXYGEN AND FREE CARBON DIOXIDE IN A LABORATORY CHANNEL,
Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries Lab.
B. Stott, and D. G. Cross.
Water Research, Vol 7, No 5, p 793-805, May 1973. 3 fig, 6 tab, 14 ref.

Descriptors: *Dissolved oxygen, *Carbon dioxide, Water pollution effects, *Bioassay, *Fish behavior, Channels, Anaerobic conditions, Freshwater fish, Oxygen sag, Laboratory tests, Laboratory equipment, Volumetric analysis, Anaerobic conditions.
Identifiers: Rutilus rutilus, *Avoidance reactions, *Roach, Dropping mercury electrode.

Experiments were carried out with roach (Rutilus rutilus) in a laboratory channel to determine their behavior in relation to levels of dissolved oxygen and free carbon dioxide. The channel was made by joining 9 iron-framed glass aquaria by PVC pipe set in marine plywood at the end of the aquaria. The sides of the aquaria were covered with polyethylene sheeting to prevent the fish seeing out. Dechlorinated, deoxygenated water was used and N2 was bubbled through aerators to replace the air above the channel. Before experiments on avoidance reactions were started between 25 and 30 roach, 10-12 cm long, were introduced into the apparatus, confined to an area consisting of either tanks 1-4, or 1-5, and fed on Tubifex and Daphnia. The fish were kept in the original area for at least 5 weeks before a homing experiment was attempted. This consisted of opening the gate at the downstream end of the area and driving the fish to tanks 8 or 9 with a hand net and the light from a torch. All the gates in the channel were then closed and the fish allowed about 1 h to settle down before all the gates were re-opened by remote control. Subsequently the positions of the fish were noted at intervals of about 2 h. Falling concentrations of dissolved oxygen in the channel caused the roach to move downstream to better oxygenated water by means of a predominantly appropriate response. When an aerated water flow was restored the fish quickly reoccupied their original position. Fish newly introduced into the channel responded in a similar manner except that they did not return to the original position. Roach acclimated to a reduced level of dissolved oxygen needed a rather lower oxygen level to cause the downstream movement. An increase in the amount of free carbon dioxide together with a reduction in oxygen content induced fish to respond to higher levels of oxygen than if the oxygen only was reduced. (Holoman-Battelle)
W73-11011

TOXICITY, RESIDUE DYNAMICS, AND REPRODUCTIVE EFFECTS OF PHTHALATE ESTERS IN AQUATIC INVERTEBRATES,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
H. O. Sanders, F. L. Mayer, and D. F. Walsh.
Environmental Research, Vol 6, No 1, p 84-90, March 1973. 3 tab, 22 ref.

Descriptors: *Crayfish, *Midges, Mayflies, Toxicity, Bioassay, Reproduction, Absorption, Daphnia, Water pollution effects, Acaricides, Pesticide toxicity, Pesticide residues, Crustaceans, Invertebrates, Nymphs.
Identifiers: *Phthalate esters, *Biological magnification, *Scuds, *Glass shrimp, *Palaemonetes kadiakensis, *Aquatic sowbug, Bioaccumulation, Plasticizers, Daphnia magna, Gammarus pseudolimnaeus, Orconectus nais, Asellus brevicaudus, Ischnura verticalis, Hexagenia bilineata, Chironomus plumosus, Phthalate esters, Macroinvertebrates.

Scuds (Gammarus pseudolimnaeus), glass shrimp (Palaemonetes kadiakensis), crayfish (Orconectes nais), waterfleas (Daphnia magna), aquatic sowbugs (Asellus brevicaudus), and three species of immature aquatic insects, damselfly nymphs (Ischnura verticalis), burrowing mayflies (Hexagenia bilineata), and midge larvae (Chironomus plumosus) were collected from streams and ponds in Missouri for use in studying the bioaccumulation, biomagnification, and toxicity of di-2-ethylhexyl and di-n-butyl phthalates. Acute toxicity tests were conducted for 96 hours under static conditions as TL50 values. Accumulation experiments were conducted in an intermittent-flow system. The phthalate esters were labeled with C-14 for radiometric analysis of water and organisms. Reproductive tests were conducted with Daphnia in the intermittent-flow system with concentrations of 3, 10, and 30 ppb. The acute toxicities were low and ranged from 2.1 mg/liter to greater than 32 mg/liter. Residue accumulation was rapid resulting in body residues 70-13,600 times that of the water concentration. Phthalate residues were essentially gone after 10 days in fresh water. A reproductive impairment of 60 percent occurred in Daphnia magna exposed continuously to 3 ppb of di-2-ethylhexyl phthalate. (Little-Battelle)
W73-11020

MICROBIAL COMMUNITY STRUCTURE IN CONTAMINATED ESTUARIAN SEDIMENTS,
North Texas State Univ., Denton.
A. Roach, J. K. G. Silvey, and R. K. Guthrie.
Journal Water Pollution Control Federation, Vol 45, No 2, p 365-368, February 1973. 2 fig, 13 ref.

Descriptors: *Biological communities, *Estuarine environment, *Sediments, *Distribution patterns, *Bacteria, Sampling, Ecology, Culture, *Texas, Gulf Coast.
Identifiers: Data interpretation, Culture media.

Punch cores were taken at 4-m intervals along transects in estuarian flats near Flour Bluff, Texas. One tenth ml of mud from a subcore drawn at 2 dm of each core and at each 0.5 dm of the cores was diluted 1:1,000 and placed on an extract medium. The extract medium was designed to give the broadest possible cross section of microbial population and was prepared by (1) adding 500 ml of deionized water to 500 g of mud; (2) cooking for 30 minutes at 90C in a double boiler; (3) allowing mud to settle and decanting; (4) adding 2 g yeast extract, 15 g mannitol, 0.5 g each of calcium sulfate and magnesium sulfate, 20 g agar, and sufficient deionized water to make 1 liter. Frequencies were plotted for each organism encountered on five plates per subcore sample. A Raunkiaeran frequency spectral analysis showed that a structured community rather than a heterogeneous mixture existed laterally over the space of some 80 m in uniform bottom mud. Moreover, such structure resembled that of an undisturbed, climax surface community. A community coefficient analysis showed no significant stratification or vertical discontinuity to a depth of 9 dm. (Little-Battelle)
W73-11025

TOXIC EFFECTS OF MERCURY ON THE ACTIVATED SLUDGE PROCESS,
Maine Univ., Orono. Dept. of Civil Engineering.
M. M. Ghosh, and P. D. Zugger.
Journal Water Pollution Control Federation, Vol 45, No 3, p 424-433, March 1973. 8 fig, 7 tab, 20 ref.

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Descriptors: *Mercury, *Activated sludge, *Toxicity, *Chemical oxygen demand, *Biomass, *Aerobic conditions, Heavy metals, Reduction (Chemical), Growth rates, Artifical substrates, Absorption, Oxygen.
Identifiers: Volatile suspended solids, Substrates utilization.

A study to determine the toxic effects of mercury on the activated sludge process was made in the laboratory under controlled batch-fed conditions. The threshold mercury concentrations that were required to inhibit biological activities were between 2.5 and 5.0 mg Hg (2 plus)/1, when the food: microorganism ratio was 1.0 and the mixed liquor volatile suspended solids concentration was 2,000 mg/1. However, at dosages as high as 10.0 mg Hg (2 plus)/1, recovery occurred within a few hours. Chemical oxygen demand reduction was obtained in the samples having higher mercury concentrations, but the demand reduction and growth of sludge were both reduced from the conditions present in the nonstressed studies. (Holoman-Battelle)
W73-11026

OSMOTIC REVERSAL OF TEMPERATURE SENSITIVITY IN ESCHERICHIA COLI,
Ottawa Univ. (Ontario). Dept. of Biology.
A. Z. Bilsky, and J. B. Armstrong.
Journal of Bacteriology, Vol 113, No 1, p 76-81, January 1973. 4 fig, 2 tab, 25 ref.

Descriptors: Temperature, *Pollutant identification, *Osmosis, Antibiotics (Pesticides), Stability, Isolation, Environmental effects, *E. coli, Sodium chloride, Coliforms, Enteric bacteria, Aerobic bacteria.
Identifiers: *Mutants, E. coli K-12, *Sensitivity, Bacterial physiology, Biochemical tests, Culture media, Glycerol, Sucrose, Inositol, Potassium chloride, Magnesium chloride, Valinomycin, Lincomycin, Streptomycin, Vancomycin, Bacitracin, Novobiocin, Osmolality, Mutagenicity, N-methyl-N-nitro-N-nitrosoguanidine, Growth media, Deoxycholate, Methylene blue, Ethylenediaminetetraacetic acid, Acridine orange, Acriflavine, Triphenyl tetrazolium chloride.

Forty temperature-sensitive mutants, unable to grow on tryptone or nutrient agar at 42C, were isolated from Escherichia coli K-12. When 0.5 percent NaCl was added to the medium, 32 grew at the nonpermissive temperature. Several were tested with different amounts of NaCl added to tryptone broth; all grew best when the osmolality of the medium was between 400 and 1,000 milliosmolal. One of the mutants was studied in more detail. Sucrose, inositol, KCl, and MgCl2, as well as NaCl, permitted growth at 42C. Glycerol, however, had no effect. When shifted from 30 to 42C without osmotic protection, the mutant stopped growing but did not lyse, die, or leak significant amounts of intracellular material. In a similar shift experiment, a second mutant leaked all of its trichloroacetic acid-soluble pools into the medium. The majority of the mutants were hypersensitive to certain antibiotics, indicating possible cell envelope defects. (Holoman-Battelle)
W73-11028

RADIATION-RESISTANT MUTANTS OF SALMONELLA TYPHIMURIUM LT2: DEVELOPMENT AND CHARACTERIZATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
For primary bibliographic entry see Field 05B.
W73-11029

OBSERVATIONS ON THE TRANSPARENCY OF THE WATERS OF THE PULICAT LAKE WITH PARTICULAR REFERENCE TO PLANKTON PRODUCTION,
Central Inland Fisheries Research Inst., Madras (India).
M. Kaliyamurthy.
Hydrobiologia, Vol 41, No 1, p 3-11, February 28, 1973. 5 fig, 1 tab, 14 ref.

Descriptors: *Zooplankton, *Phytoplankton, *Light penetration, *Aquatic productivity, Primary productivity, Secondary productivity, Turbidity, Plankton nets, Aquatic life, Secchi disks, Tidal effects, Estuarine environment.
Identifiers: *Transparency, Seasonal variation, *India (Pulicat Lake).

The relationship of the transparency of the waters of Lake Pulicat to plankton productivity was investigated for the period January 1968 to December 1970. Light penetration was measured at varying times with a Secchi disc 20 cm in diameter from a stationary boat. Simultaneously, plankton was collected by hauling a 50-cm diameter tow net for 15 minutes. The plankton was fixed in 5 percent formalin and counted using a Sedgwick-Rafter counting cell. Marked sectoral and seasonal variations were observed in relation to transparency but no tidal effects were noted. Varying relationships were noted between plankton and the attenuation coefficient 'k' in the two sectors, of the Lake. (Holoman-Battelle)
W73-11046

THE EFFECTS OF POLLUTION ON GAMMARUS PULEX (L) SUBSP, PULEX (SCHELLENBERG) IN THE INLET STREAMS OF ROSTHERNE MERE, CHESHIRE,
Northumberland Coll. of Education, Newcastle-upon-Tyne (England). Dept. of Environmental Science.
J. E. Hobrough.
Hydrobiologia, Vol 41, No 1, p 13-35, February 28, 1973. 12 fig, 7 tab, 21 ref.

Descriptors: *Water pollution effects, *Life history studies, Amphipoda, Physical properties, Chemical properties, Water sampling, Benthic fauna, Juvenile growth stage, Resistance, Freshwater, Crustaceans, Invertebrates, Aquatic animals, Dissolved oxygen, Water temperature, Biochemical oxygen demand, Electrolytes, Acidity, Hydrogen ion concentration, Diptera, Stoneflies, Streamflow, Mature growth stage, Breeding, Farm wastes, Drainage water, Roads, Midges, Animal populations.
Identifiers: *Macroinvertebrates, *Gammarus pulex, *Rostherne Brook, *Dolls Meadow, England, Scuds, Polycelis felina, Substrates, Chironomids.

Two inlet streams, Rostherne Brook and the Southern Drain of Dolls Meadow, flowing into Rostherne Mere, Cheshire were sampled for macroinvertebrata, and their physical and chemical conditions analyzed. The physical and chemical factors for these streams were similar, except for the stream beds and the pollution of Rostherne Brook. Both streams had large populations of Gammarus pulex and the life history of this organism was studied. The ratio of adult organism to juvenile differed in the two streams, Rostherne Brook having a higher proportion of adults in winter and juveniles in summer as opposed to the Southern Drain in which a normal life history was exhibited. Experiments showed that these differences were not related to differences in stream bed conditions. It was considered that the different adult to juvenile ratios were therefore caused by pollution in Rostherne Brook. The juveniles were more tolerant to pollution and therefore more able to survive the summer when pollution effects were at a maximum. The life history was altered in Rostherne Brook by pollution. Instead of the dual life history produced by overwintering juveniles and speedy summer maturation, a simple alternation of juveniles and adults was seen. This change in life history enabled Gammarus to survive in the polluted waters of Rostherne Brook. (Holoman-Battelle)
W73-11047

MICROBIAL DECOMPOSITION OF PENTACHLOROPHENOL,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-11048

5D. Waste Treatment Processes

TECHNICAL, ECONOMIC AND LEGAL ASPECTS INVOLVED IN THE EXCHANGE OF SEWAGE EFFLUENT FOR IRRIGATION WATER FOR MUNICIPAL USE, CASE STUDY - CITY OF TUCSON,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, K. J. DeCook, and W. G. Matlock.
Available from the National Technical Information Service as PB-220 948, $3.00 in paper copy, $0.95 in microfiche. Completion Report, December 1972. 74 p, 17 fig, 14 tab, 35 ref. OWRR A-022-ARIZ (6). 14-31-0001-3203.

Descriptors: *Water transfer, *Sewage effluents, *Institutional constraints, Economic efficiency, Legal aspects, *Water reuse, *Irrigation water, Water pollution control, Crop response, *Arizona, *Water districts, Nutrients.
Identifiers: Metropolitan wastewater districts, Wastewater recharge, *Tucson, Region.

A case study of the Tucson region illustrates the relevant legal, economic and technical aspects of transferring high quality irrigation water to municipal use in exchange for nutrient-rich treated sewage effluent. In effect, irrigation water would be cycled through the municipal system prior to use on the farms, utilizing existing or new pipelines and evidently without modification of existing statutes. Three basic plans could be instituted in the Tucson region: (1) Exchange with an existing irrigation district; (2) exchange with a newly organized district covering existing irrigated lands; and (3) exchange with a proposed consolidated district owned and operated by metropolitan agencies. To varying degrees, these alternative plans offer the capability of distributing much of the treated effluent over irrigated acreages of crops already being grown in the Avra-Marana area, at delivery cost competitive with that of pumped water. Under each system, the efficiency of use depends upon seasonal blending or alternating of effluent with ground water, in proper proportions. Approximately 20,000 acres would be required to efficiently utilize the projected 1995 effluent production. Any such system contains the inherent advantage of a water-quantity multiplying factor due to reuse. Similar exchange arrangements may prove to be feasible in other regions containing irrigated agriculture.
W73-10402

THE HYDRAULICS OF WASTE STABILIZATION PONDS, PART I. THE EFFECT OF HYDRAULIC FLOW CHARACTERISTICS ON TREATMENT EFFICIENCY, PART II. THE EFFECT OF WIND ON MIXING IN STRATIFIED AND UNSTRATIFIED PONDS.
Utah Center for Water Resources Research, Logan.
G. Z. Watters, K. A. Mangelson, and R. L. George.
Available from the National Technical Information Service as PB-220 955, $3.00 in paper copy, $0.95 in microfiche. Publication PRCWRR18-1, February 1973. 100 p, 64 fig, 13 tab, 65 ref. OWRR A-008-UTAH (4). 14-31-0001-3545.

Descriptors: *Hydraulic flow, Mixing, Sewage lagoons, Dye concentrations, *Tracers, Hydraulic models, Density stratification, Baffles, Diffusion, Treatment, Dispersion, Stratification, Prototypes, *Utah, *Oxidation lagoons, *Waste water treatment.
Identifiers: Logan (Utah), Rhodamine WT, Fluorometer, Cache Valley.

The treatment efficiency of waste stabilization ponds can be influenced significantly by the hydraulic flow patterns within the ponds. To evaluate the effects of shape and depth of the ponds, placement of inlets and outlets, baffling and density stratification an hydraulic model of the prototype Logan City ponds was constructed. The mixing properties of the model ponds were evaluated by injecting a slug of rhodamine WT dye into the inflow and measuring the dye concentration vs time at the outlet. Concentration curves represent the time each dye particle remains in the pond. Coupling this information with the first-order reaction equation provides a measure of treatment efficiency. The position of inlets and outlets was found to change treatment efficiency by about 20%; however, with proper baffling virtually ideal treatment efficiences were obtained. A mathematical (finite-stage) model of the mixing process was adapted to stabilization ponds to determine if a more theoretical design was feasible. The model can be combined with the first-order reaction equation to predict treatment efficiency. A windwater tunnel was constructed to simulate a windover-water situation. A relationship between wind velocity and surface shear stress was established. Diffusion coefficients describing the wind driven mixing of an injected dye were evaluated as functions of the surface shear-velocity Reynolds number. For constant density flows the diffusion coefficient tended toward stabilization at higher Reynolds numbers. The upwind diffusion coefficient was found to be about twice the downwind coefficient. The Reynolds number at which stratification breaks down and complete mixing occurs was established as a function of density differences and relative thicknesses of the two layers.
W73-10414

EFFECTS OF IRON ON ACTIVATED SLUDGE TREATMENT,
Marquette Univ., Milwaukee, Wis.
J. L. Carter, and R. E. McKinney.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE2, p 135-152, April 1973. 9 fig, 3 tab, 24 ref.

Descriptors: *Activated sludge, *Iron, *Sewage treatment, *Metabolism, Heavy metals, Chemical oxygen demand, Biochemical oxygen demand, Temperature, Hydrogen ion concentration, Dissolved oxygen, Suspended solids, Sewage effluents, Chemical reactions, Sewage bacteria, Chemical analysis, Reduction (Chemical), Nutrients, *Waste water treatment.
Identifiers: Pollutant effects, *Substrate utilization, Sludge volume index, Volatile suspended solids, Actinomycetes, Sewage microorganisms, Settleability, Standard methods.

Research was conducted in order to relate the iron ion concentration with the rate of biological metabolism as well as sludge bulking conditions in activated sludge treatment. Five-liter batch activated sludge units were fed glucose and an inorganic substrate using a typical fill and draw procedure. Sodium bicarbonate buffer was used to minimize the precipitation of important elements. Various concentrations of iron were fed during this study. Tests consisting of COD, BOD, MLSS, MLVSS, and sludge volume index (SVI) were conducted to evaluate these systems. Other related parameters such as temperature, pH, dissolved oxygen, and individual ion analysis were periodically measured. Iron was measured using the pyridine method described in 'Standard Methods'. Rates of metabolism were determined by measuring the soluble COD and MLVSS for various time intervals after feeding. Microscopic observations were conducted regularly throughout the research. This work showed that insufficient iron in activated sludge treatment systems decreases the rate of organic metabolism and causes bulking conditions. Variations in other biological treatment parameters may be associated with iron or other inorganic nutrient limitation conditions. (Holoman-Battelle)
W73-10512

SIMULTANEOUS QUANTITATION OF SALMONELLA SPECIES AND PSEUDOMONAS AERUGINOSA. I. POLLUTED WATERS. II. PERSISTENCE OF PATHOGENS IN SLUDGE TREATED SOILS. III. ANALYSIS OF WASTE TREATMENT SLUDGES FOR SALMONELLA SPECIES AS A SURVEILLANCE TOOL,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05B.
W73-10549

POLLUTION ABATEMENT PROCESS FOR REFINERY WASTE WATER,
Texaco Inc., New York. (assignee).
J. P. Tassoney, and R. M. Dille.
U. S. Patent No. 3,725,270, 5 p, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 315, April 3, 1973.

Descriptors: *Patents, Sulfides, Fuels, *Hydrogen sulfide, Gases, *Industrial wastes, *Oil wastes, Oily water, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control, Chemical reactions.
Identifiers: *Refinery wastes, Sour water.

A stream of refinery waste water is introduced into a refractory-lined reaction zone of a free-flow noncatalytic synthesis gas generator in admixture with a hydrocarbonaceous fuel. By the partial oxidation reaction at an autogenous temperature in the range of 1500 to 3000 deg F and a pressure in the range of 1 to 250 atmospheres, the feed to the gas generator is reacted with an oxygen rich gas to produce a hot effluent stream of synthesis gas comprising a mixture of H2, CO, CO2, and H2O and containing a relatively minor amount of H2S, COS, A, N2, CH4 and particulate carbon. The H2S may be recovered and the purified water may be released for disposal. (Sinha-OEIS)
W73-10582

PROCESS FOR REMOVING METAL COMPOUND CONTAMINANTS FROM WASTE WATER,
Haviland Products Co., Grand Rapids, Mich. (assignee).
J. M. Haviland.
U. S. Patent No. 3,725,266, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: *Patents, *Industrial wastes, *Metals, *Waste water treatment, Pollution abatement, *Carbonates, Aluminum, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Zinc.
Identifiers: Silver, Tin, *Hydroxides.

One or more precipitating agents such as hydroxides and carbonates are added to the contaminated water to form a sludge. After settling the sludge is removed and placed in a centrifuge for further treatment. The supernatant liquid may then be disposed without damage to the environment. Fifteen examples are cited. The metal compounds which may be removed in this manner are: aluminum, cadmium, copper, chromium, iron, manganese, mercury, lead, nickel, silver, tin, and zinc. (Sinha-OEIS)
W73-10584

WASTE WATER TREATMENT PROCESS,
Signal Oil and Gas Co., Los Angeles, Calif. (assignee).
D. W. Wheeler.
U. S. Patent No. 3,725,264, 4 p, 1 fig, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: *Patents, Pollution sources, *Oil wastes, *Oil pollution, Separation techniques, *Nickel, *Waste water treatment, Catalysts, Chemical reactions, Pollution abatement, *Oil industry, *Industrial wastes.

Controlled amounts of oxygen, air, and a catalyst are injected into waste water containing residual oil and dissolved sulfides. The mixture is pumped under pressure into a flotation cell or tank where the pressure is released and the sulfur and oil are separated from the water by flotation. The catalyst may be any effective water soluble compound, preferably a nickel compound. Three examples are cited. (Sinha-OEIS)
W73-10585

WASTE WATER TREATMENT,
R. H. Harris, and E. F. Morey.
U. S. Patent No. 3,725,263, 5 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: *Patents, *Coagulation, *Filtration, Chemical reaction, Turbidity, *Waste water treatment, Pollution abatement, Water quality control, Polymers, *Filters.
Identifiers: Alum, Ferric sulfate.

A pilot filter apparatus uses a coarse to fine mixed bed or dual bed filter media and continuously monitors and compares the turbidity of chemically treated water passing through a point intermediate the length of the bed with the turbidity of water passing from the filter as final effluent. The clarification chemicals recommended are alum, ferric sulfate, or organic polymers. (Sinha-OEIS)
W73-10586

REMOVAL OF MERCURY FROM LIQUIDS USING KERATIN DERIVATIVES,
Department of Agriculture, Washington, D.C. (assignee).
M. Friedman.
U. S. Patent No. 3,725,261, 3 p, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 313, April 3, 1973.

Descriptors: *Patents, *Waste water treatment, *Mercury, *Metals, Chemical reactions, Water quality control, Pollution abatement, Water pollution control.
Identifiers: *Keratin, Chemical treatment.

Water containing mercury is treated with a keratin derivative. The keratin derivative acts as an absorbent and the mercury becomes bound to the keratin. Three examples are cited. Suspended particles of elemental mercury may be removed by physical entrapment. In the keratin treatment the reaction is conducted at room temperature but the reaction may be speeded up by increasing the temperature. It is preferred that atmospheric oxygen be excluded from the reaction system. The exclusion is attained by sweeping a non-oxidizing gas such as nitrogen or helium through the system. (Sinha-OEIS)
W73-10587

PROCESS FOR RECOVERY OF MINERAL POLLUTANTS FROM ACIDIC WASTE STREAMS,
Aerojet-General Corp., El Monte, Calif. (assignee).
D. O. DePree.
U. S. Patent No. 3,725,259, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 313, April 3, 1973.

Descriptors: *Patents, *Acid mine water, Streams, Lakes, Rivers, *Waste water treatment, *Industrial wastes, Pollution abatement, *Metals.
Identifiers: *Metal salts removal, Pickling plants, Electroplating baths.

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The acidic waste stream is led to the weak acid cation exchange bed in a countercurrent pass. The cation exchange resin in the bed removes the metals from the stream. The stream then moves on to a neutralization zone. Lime or calcium carbonate is introduced into the neutralization zone. The purified water is led away for disposal. The spent resin is moved to a regeneration zone where it is treated with a ligand or chelating solution. Twelve examples are cited. (Sinha-OEIS)
W73-10588

APPARATUS FOR CLEANING SEWAGE WATER,
Adaks Products Inc., (assignee).
H. K. Heen.
U. S. Patent No. 3,725,205, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 301, April 3, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Evaporators, *Condensation, Equipment, Water quality control, *Distillation, Pollution abatement.

Sewage water is fed to a surge tank, and from there, periodically and in predetermined quantities, through a batching valve to a sealed evaporator tank, which is surrounded adjacent its lower end by a condensing chamber. When the level of the liquid in the evaporator drops to a predetermined low limit, sensing means opens the batching valve momentarily to fill the tank, thereby starting a vacuum pump which reduces the pressure in the tank and chamber approximately to the saturated vapor pressure in the tank. A vapor fan then pumps vapor from the tank to the chamber, where the vapor condenses and transfers heat to the remaining sewage water in the tank. Periodically the slurry in the tank is automatically discharged and incinerated. (Sinha-OEIS)
W73-10590

APPARATUS FOR MONITORING AND CONTROLLING HALOGEN LEVELS IN A WATER TREATMENT SYSTEM,
Halogen Controls, Inc., Barrington, Ill. (assignee).
For primary bibliographic entry see Field 05F.
W73-10593

PROCESS FOR REMOVAL OF AMMONIA FROM WASTE WATER STREAMS,
D. W. Breck.
U. S. Patent No. 3,723,308, 7 p, 1 fig, 9 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 1116, March 27, 1973.

Descriptors: *Patents, *Ammonia, *Municipal wastes, *Agricultural runoff, *Industrial wastes, Ion exchange, *Waste water treatment, Pollution abatement, Water quality control, *Zeolites.

Ammonium ions are removed from aqueous solutions containing one or more alkali or alkaline earth cations by effecting the removal with Zeolite F, a synthetic crystalline aluminosilicate having a silica to alumina oxide mol ratio of about 2 and having been derived from a potassium-rich reaction mixture. (Sinha-OEIS)
W73-10594

APPARATUS FOR TREATING WASTE WATER,
Pollutrol Industries, Inc., Portland, Maine. (assignee).
K. L. Rost.
U. S. Patent No. 3,721,344, 5 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 908, No 3, p 625, March 20, 1973.

Descriptors: *Patents, *Waste water treatment, Equipment, *Aeration, *Pollution abatement, Water pollution control, Water quality control, Settling basins.
Identifiers: *Settling chambers.

This apparatus consists of two chambers, the first for the reception of waste water and the second which functions as a settling chamber. Each chamber has a device for aeration. The second chamber has a discharge provided with an overflow inlet and an expansion chamber extending downward into it. Means are provided to deliver air into the expansion chamber to force water out of it thus to raise the second chamber level to cause an overflow through the discharge, the overflow being relatively clear after a predetermined settling interval. (Sinha-OEIS)
W73-10600

MACHINE FOR REMOVING SEDIMENTARY MATERIAL FROM FILTER BEDS,
Gewerkschaft Eisenhuette (West Germany). (assignee)
For primary bibliographic entry see Field 05F.
W73-10602

WATER PURIFYING DEVICE,
For primary bibliographic entry see Field 05F.
W73-10605

FILTRATION PROCESS FOR CLARIFICATION,
Erbara-Infilco Ltd., Tokyo (Japan). (Assignee)
For primary bibliographic entry see Field 05F.
W73-10606

SURFACTANTS IN SEWAGE AND THEIR POSSIBLE REMOVAL, (IN ITALIAN),
Stazione Sperimentale degli Olii e dei Grassi, Milan (Italy).
A. Arpino, G. Mariani, and N. Quarenghi.
Riv Ital Sostanze Grasse. Vol 49, No 3, p 121-127, 1972. Illus. English summary.
Identifiers: *Sewage, *Surfactants, Waste water treatment, Treatment facilities.

An experimental study to remove surfactants from sewage is presented together with a treatment plant scheme. The described procedure is essentially based on the physical principle of blowing in air and removing the foam produced; the plant is completed by a foam combustion zone. By comparing the initial data with those obtained after some years of operation, and considering the occurrence of various types of surfactants in waters treated, an average qualitative yield of about 91% is expected. Results obtained may be considered satisfactory, considering that naphtha consumption, even though not a minor factor, represents practically the sole element of plant operation cost.--Copyright 1973, Biological Abstracts, Inc.
W73-10634

WATER QUALITY MANAGEMENT PLAN, INTERIM ST. CROIX RIVER BASIN.
Creative Research Services, Inc.
For primary bibliographic entry see Field 05G.
W73-10689

EFFECTIVE MIXING IN SHALLOW BODIES OF WATER WITH AND WITHOUT DENSITY STRATIFICATION,
Utah State Univ., Logan.
K. A. Mangelson, and G. Z. Watters.
Paper presented at the 19th Annual Specialty Conference, Hydraulics Div., American Society of Civil Engineers, Iowa City, Iowa. August 1971. 27 p, 18 fig. OWRR A-008 Utah (2). 14-31-0001-3545.

Descriptors: *Dispersion, Hydraulics, *Time of concentration, *Tracers, Baffles, Hydraulic models, *Oxidation lagoons, Waste water treatment, Treatment facilities, *Mixing, *Density stratification.

Very little attention has been given to the hydraulics characteristics of waste stabilization ponds in the past. From physical observations of the Logan City waste stabilization ponds as well as from distorted model studies of these ponds, this study has demonstrated the hydraulic characteristics of shallow bodies of water under several different conditions of inflow, outflow and design of the pond, and the effects of mixing within the body on the resulting age distribution of tracer elements. While a complete description of the dispersion process is not given, a practical description, by parameters which describe the degree of mixing is used to measure the performance of the ponds. (Jeppson-Utah)
W73-10719

THE FEASIBILITY OF FLOW SMOOTHING STATIONS IN MUNICIPAL SEWAGE SYSTEMS,
Research Triangle Inst., Durham, N.C.
C. N. Click.
Copy available from GPO Sup Doc as EP1.23/2: 73-138, $1.25; microfiche from NTIS as PB-221 246, $0.95. NTIS paper copy $3.25. Environmental Protection Agency, Technology Series Report EPA-R2-73-138. February 1973. 94 p, 17 fig, 2 tab, 21 ref. EPA Project 11010 FDI. Contract 14-12-935.

Descriptors: *Surge tanks, *Sewers, *Economic feasibility, *Domestic wastes, Waste water (Pollution), Municipal wastes, Sewage, Sanitary engineering, Water pollution control, Feasibility studies, *Cost comparisons, Estimated benefits, *Design criteria, *Hydraulic conduits, Sewerage, Waste water treatment.
Identifiers: *Flow smoothing, Flow Equalization.

Flow smoothing in sanitary sewers was studied to determine under what conditions the resulting higher flow capacities can be economically obtained. Conservative assumptions were made in this preliminary design and economics study to provide a severe test for the cost effectiveness of the concept. In many situations, flow smoothing is an attractive alternative when compared to relief pipe installation. Circumstances which favor flow smoothing are high interest rates, high peak-to-average flow rations, low pipe slopes, small diameters, and low design depths of flow. Flow smoothing is strongly favored where earthen construction can be utilized. (Bostian-EPA)
W73-10722

APPLICATION OF SELECTED INDUSTRIAL ENGINEERING TECHNIQUES TO WASTE WATER TREATMENT PLANTS,
Hittman Associates, Inc., Columbia, Md.
R. Waller, and C. W. Mallory.
Copy available from GPO Sup Doc as EP1.23/2: 73-176, $2.60; microfiche from NTIS as PB-221 144, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-176. February 1973, p 226, 19 fig, 13 ref. EPA Project 17090 FYZ. EPA Contract 14-12-946.

Descriptors: *Water Quality Control, Waste water treatment, *Operation and maintenance, Reliability, Personnel management, *Michigan, *Treatment facilities.
Identifiers: *Flint (Mich), *Industrial Engineering techniques.

The applicability of various industrial engineering techniques to operation and maintenance of secondary waste treatment plants was evaluated. Numerous techniques used in military and industrial projects were evaluated and applied in a case study at the Flint, Michigan, waste treatment plant using actual plant data, practices, and procedures. Emphasis was placed on Work Study and Reliability and Maintainability analysis. A variety of techniques were directly and beneficially applicable to the development of rational management programs for design, operation, maintenance, staffing, and quality control. An overall approach

o develop complete management programs was developed whereby designers or managers could start from effluent goals and rationally develop designs, O and M procedures, and staffing levels as well as increase plant reliability. Quality control programs are hampered by: poor parameters for measuring effluent quality and process control; lack of knowledge of causes of variability of plant effluent quality as well as the nonsteady state effects of equipment failures; the prevailing practices for setting quality goals, collecting and evaluating performance data; and current practices for enforcement of performance requirements by regulatory agencies. A number of recommendations were offered to develop programs for upgrading waste water plant management. (EPA)
W73-10723

DEWATERING OF MINE DRAINAGE SLUDGE PHASE II,
West Virginia Univ., Morgantown,
D. J. Akers, Jr., and E. A. Moss.
Copy available from GPO Sup Doc as EP1.23/2: 3-169, $2.10; microfiche from NTIS as PB-221 45, $0.95. Environmental Protection Agency Technology Series Report EPA-R2-73-169, February 1973. 152 p, 30 fig, 43 tab, 18 ref. EPA Project 14010 FJX.

Descriptors: *Acid mine water, *Neutralization, Sludge treatment, Freezing, *Flocculation, Centrifugation, *Dewatering, *Waste water treatment, Filtration, Filters, Drying, *Mine drainage.
Identifiers: Filter aids, Vacuum filtration, Pressure filtration, Porous bed filtration.

A study of various acid mine drainage sludge conditioning methods and dewatering systems was made. Acid mine drainage and sludge from neutralization plants were characterized. Four sludges were selected as being representative of the various types of sludges produced by the lime/limestone neutralization of acid mine drainage. The conditioning methods studied were: freezing, use of flocculants, and use of filter aids. The six dewatering systems evaluated were: (1) conventional rotary vacuum filtration, (2) rotary precoat vacuum filtration, (3) pressure filtration, (4) porous bed filtration, (5) thermal spray drying, and (6) centrifugation. No single dewatering system was best for all acid mine drainage sludges. On the basis of cost, the most promising acid mine drainage sludge dewatering techniques appear to be centrifugation, rotary vacuum filtration and rotary precoat vacuum filtration. (See also W72-07101) (Hill-EPA)
W73-10724

FIELD EVALUATION AND DESIGN CONSIDERATIONS OF AEROBIC DIGESTION,
Ministry of the Environment, Toronto (Ontario). Research Branch.
N. R. Ahlberg, and A. V. Giffen.
Research Report W40, May 1972. 53 p, 1 fig, 7 tab, 2 ref.

Descriptors: *Water pollution control, *Waste water treatment, *Aerobic treatment, *Surveys, Design criteria, Treatment facilities, Waste water treatment, Oxygen, Temperature, *Sludge digestion, Waste disposal.
Identifiers: Digester capacity.

Presented is a survey of aerobic digesters used to stabilize waste sludges from seven water pollution control plants in the Province of Ontario, conducted over an eighteen month period. Air flow rates of 20 cfm/1000 cu. ft. of digester capacity were inadequate for both mixing and oxygen requirements in certain installations. Air flow rates determined on the basis of sludge age and solids concentrations indicate that rates of approximately 50 cfm/1000 cu. ft. of digester capacity are required. To produce a stable sludge, a total sludge age in excess of 120 days is required. To effect sludge concentration and to provide the necessary sludge age, a two stage digester should be provided for all plants except the extended aeration modification of the activated sludge process. The reduction of volatile solids is not a practical indicator of digested sludge stability. Digesting sludge stability is best indicated by the specific oxygen uptake rate; this rate is temperature dependent. Operational problems can result from temperature extremes in the digester; however, temperature variations can be minimized by the physical design of the plant. A substantial literature review, field study procedures, a description of treatment facilities, and a discussion of the results are included. (Bell-Cornell)
W73-10738

EFFECT OF A GRASS AND SOIL FILTER ON TUCSON URBAN RUNOFF: A PRELIMINARY EVALUATION,
Arizona Water Resources Research Center, Tucson.
B. P. Popkin.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 235-261, (1972). 16 fig, 1 tab, 21 ref. OWRR B-023-ARIZ (1).

Descriptors: *Grasses, *Soils, *Urban runoff, *Water quality control, *Treatment, Storm runoff, Lysimeters, Loam, Water sampling, Inorganic compounds, Chemical oxygen demand, Coliforms, Turbidity, Sediments, Leaching, Watershed management, Arizona, Arid lands.

Because storm runoff from the Tucson metropolitan area requires processing for most uses, a grass and soil filter lysimeter was constructed and evaluated as a water-quality treatment facility. The 200x4x5 foot lysimeter contains homogeneous calcareous loam covered by common grasses. Less than a cubic foot per second of storm runoff flows by gravity over the lysimeter where surface inflow, surface outflow and subsurface outflow are measured and sampled. Four discrete trials were conducted in the fall of 1971, where water samples were analyzed for inorganic chemical constituents, chemical oxygen demand (COD), coliforms, turbidity and sediment. Concentrations of COD, coliforms, turbidity and sediment in subsurface-outflow samples decreased significantly during each trial, though early trials showed extensive leaching. Surface-outflow samples had lower turbidity, COD, coliforms and sediment than inflow samples. Turbidity, suspended and volatile solids, coliforms, and COD in runoff samples may be reduced by grass and soil filtration. Grass development and soil settling work to produce a better quality outflow. Quantification of the lysimeter's effectiveness will be useful for urban watershed management in arid lands. (See also W73-10818) (Popkin-Arizona)
W73-10835

NITROGEN SPECIES TRANSFORMATIONS OF SEWAGE EFFLUENT RELEASES IN A DESERT STREAM CHANNEL,
Arizona Water Resources Research Center, Tucson.
P. G. Sebenik, C. B. Cluff, and K. J. DeCook.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 263-275, (1972). 5 fig, 1 tab, 7 ref. OWRR A-022-ARIZ (5).

Descriptors: *Nitrogen cycle, *Sewage effluents, *Ephemeral streams, *Arid lands, *Water pollution, Effluent, Streams, Surface waters, Sewage treatment, Irrigation water, Water sampling, Daily hydrographs, Nitrification, Stream stablization, Rates, Groundwater recharge, Surface-groundwater relationships, *Arizona.

Treated sewage effluent is sometimes utilized as a source of irrigation water. This study was made to examine nitrogen species transformations of effluent releases in the channel of an ephemeral stream in southern Arizona. Water samples were taken at locations in sequence so that peak daily flows could be traced as effluent moved downstream. Increased nitrification, coinciding with changing stream characteristics, starts at 6.3 river miles from the Tucson Sewage Treatment Plant discharge. Nitrate-nitrogen values reach a maximum at about 90-95 percent and 60-80 percent of total flow distance for low flows and high flows respectively. Thr rate of nitrification within sewage effluent releases in a desert stream channel is related to flow distance and physical characteristics of the stream. Once nitrogen loss mechanisms are known, it may be economically feasible to manage the sewage effluent regime to stimulate increased nitrogen loss, thereby reducing the nitrate-nitrogen concentrations in groundwater recharge. (See also W73-10818) (Popkin-Arizona)
W73-10836

EVALUATION OF A TURFGRASS-SOIL SYSTEM TO UTILIZE AND PURIFY MUNICIPAL WASTE WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
R. C. Sidle, and G. V. Johnson.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 277-289, (1972). 1 tab, 12 ref. OWRR A-025-ARIZ (3).

Descriptors: *Turf grasses, *Soil chemical properties, *Waste water treatment, *Sewage effluent, *Nitrogen cycle, Water quality, Water treatment, Irrigation water, Silts, Loam, Soil moisture, Water pollution, Arizona.

Sewage effluent for irrigation is well established. This study determines the capacity of selective turfgrass-soil systems to purify municipal sewage effluent and to measure the degree of utilization of nitrogen in the effluent by turfgrass. Chlorinated secondarily treated sewage effluent from the city of Tucson was applied to turfgrass grown on sandy loam, silt and loam, under three levels of irrigation under laboratory conditions of duplicate pots. Each pot had 2 suction probes to estimate soil moisture tensions and to allow soil water sampling. The study operated from September to March, 1972, for 30 weeks. Purification efficiency, nitrogen utilization and percent recharge were calculated. Turfgrass can be irrigated with sewage effluent at common rates without hazard of nitrogen pollution to groundwater. Purification efficiency exceeded 90 percent for all irrigation levels on sandy loam and silt. Nitrogen utilization was greater over sandy loam. Turfgrass-soil systems can utilize nitrogen and purify waste water. (See also W73-10818) (Popkin-Arizona)
W73-10837

CONCEPT EVALUATION: RECOVERY OF FLOATING OIL USING POLYURETHANE FOAM SORBENT,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05G.
W73-10884

A STUDY OF CILIATE PROTOZOA FROM A SMALL POLLUTED STREAM IN EAST-CENTRAL ILLINOIS,
Maryland Univ., College Park. Dept. of Zoology.

E. B. Small.
American Zoology, Vol 13, p 225-230, 1973. 2 fig, 2 tab, 3 ref. OWRR A-024 (7)B-028-ILL (5). 14-01-0001-1081, 14-01-0001-1898.

Descriptors: Waste water treatment, *Protozoa, Biodegradation, *Illinois, *Sewage, *Trickling filters, Filtration, Bacteria, Sessile algae.
Identifiers: *Peritrichs.

The role of species of ciliate Protozoa in trickling filter waste treatment processes awaits redefinition. Using the small fresh-water Salt Fork stream a stream which receives all of the discharge from the Champaign-Urbana Waste Treatment Plant in east-central Illinois, analyses of samples of carefully identified ciliates taken from selected sites over a three-year period yielded some interesting results. Four specific situations were noted: (1) free-swimming microphagous forms feeding selectively on primarily attached bacteria, and, in turn, being fed on by carnivorous ciliates; (2) sessile ciliates (peritrichs) feeding on non-attached bacterial species, but with high selectivity; (3) free-swimming carnivorous gymnostomes feeding on the sessile peritrichs but, again in turn, serving as prey themselves to stalked suctorian species attached to the peduncles of the peritrichs; (4) attached peritrichs and suctorians both serving as food for several groups of small invertebrates frequenting the stream. With respect to numbers and diversity of ciliates found, some 155 different species, belonging to 93 genera, were identified in the stream and/or the trickling filter settling basin. The highest populations and greatest diveristy were found at sites closest to the waste water influx; such protozoan populations might thus be considered as a form of teritary treatment in the drainage basin.
W73-10886

BIOLOGICAL CONDITIONING FOR IMPROVED SLUDGE FILTERABILITY,
Arkansas Univ., Fayetteville. Dept. of Civil Engineering.
D. G. Parker, C. W. Randall, and P. H. King.
Journal Water Pollution Control Federation, Vol 44, No 11, p 2066-2077, November 1972. 13 fig, 18 ref. OWRR A-035-VA (8).

Descriptors: *Activated sludge, *Aeration, Chlorination, *Sludge treatment, Storage, Suspended solids, *Waste water treatment, *Filtration.
Identifiers: Filterability (Sludge), Biological conditioning (Sludge).

The effect of commonly used sludge handling procedures and sludge properties on the filterability of activated sludge were studied by using time required to collect 75 ml of filtrate from a 100-ml sludge sample under uniform conditions as a filtration index. Increase of suspended solids concentration in sludge decreased its filterability, as did anaerobic storage and chlorination. However, mild aeration at rates sufficient to supply excess dissolved oxygen improved filterability to a maximum at 4 to 6 days of aeration, after which filterability decreased to near its initial value by 2 wk of aeration. Stressing the sludge to the extent that organic carbon was released apparently decreased filterability, whereas biologically active sludge benefited from the aeration. The mechanism of filterability improvement through aeration thus appears to be biologically induced flocculation.
W73-10891

CLOSING THE LOOP ON WASTE WATERS.

Environmental Science and Technology, Vol 6, No 8, p 692-693, 1972. 1 fig.

Descriptors: *Industrial wastes, *Ion exchange, *Fertilizers, *Waste water treatment, Tennessee, Industries, Nitrogen, Ammonia, Resins, North Carolina, Water pollution control, Recycling, Pollution abatement.
Identifiers: Fertilizer industry.

Waste water effluents from fertilizer-producing plants is coming under more strict regulatory control, largely because of release of pollutants into waterways. Ion exchange is moving to the forefront as one of the technologies available to handle wastes from actual producing plants. Essential steps in the ion exchange process are: collecting of plant waste waters, including runoff, in large settling ponds; filtering through anthracite coal filters to remove particulate matter; contacting waste water with strong acid cation exchange resin that removes the ammonium cation contaminant to less than 3 ppm; contacting the 'decationated' water with a weak base resin in the hydroxide form that removes the anion contaminant to 7-11 ppm nitrate; regenerating cation resin with 22% nitric acid; regenerating anion resin with 7% ammonium hydroxide; combining backwash from each separate unit and neutralizing excess acid with ammonia. Farmers Chemical Association, Inc. calculates that with the ion exchange closed loop system it would produce more than an additional 6000 tons of ammonium nitrate annually. Certainly, FCAI is the first in the industry to have licked a pollution problem that all ammonium nitrate producers share. (Jones-Wisconsin)
W73-10936

EVALUATION OF COLIFORM TESTS FOR CHLORINATED SECONDARY EFFLUENTS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 05A.
W73-11002

ENTERIC VIRUS SURVIVAL IN ALGAL-BACTERIAL WASTEWATER TREATMENT SYSTEMS-I. LABORATORY STUDIES,
California Univ., Berkeley. School of Public Health.
M. D. Sobsey, and R. C. Cooper.
Water Research, Vol 7, No 5, p 669-685, May 1973. 8 fig, 7 tab, 21 ref.

Descriptors: *Waste water treatment, *Oxidation lagoons, *Biological treatment, Laboratory tests, Bioassay, Sewage effluents, Waste water (Pollution), Cultures, Algae, Bacteria, Suspended solids.
Identifiers: *Enterovirus, *Survival, *Scenedesmus quadricauda, *Bacillus megaterium, *Inactivation, Data interpretation, Heterotrophy, Poliovirus, Culture media.

The survival of a representative enteric virus, poliovirus type 1, in laboratory models of algal-bacterial sewage treatment systems and the interactions of poliovirus with stabilization pond water was studied. In laboratory reactors a fraction of the total poliovirus present rapidly adsorbed to stabilization pond water solids by a reversible process, conforming to a Freundlich adsorption isotherm. In laboratory cultures the growth of Scenedesmus quadricauda and Bacillus megaterium in sterile sewage had no detrimental effect on poliovirus survival, whereas the growth of heterogeneous populations of stabilization pond bacteria in the same medium resulted in substantial virus inactivation. Appreciable poliovirus inactivation occurred in laboratory cultures of mixed algal-bacterial populations obtained from stabilization ponds. Because the degree of antiviral activity in these cultures was greater than that in cultures of stabilization pond bacterial alone, additional microbial factors must contribute to this virus inactivating phenomenon. The results suggest that in algal-bacterial treatment systems both virus adsorption to solids and virus inactivation due to microbial activity play a role in reducing the enteric virus concentration in wastewater. (Holoman-Battelle)
W73-11010

TOXIC EFFECTS OF MERCURY ON THE ACTIVATED SLUDGE PROCESS,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W73-11026

5E. Ultimate Disposal of Wastes

DYNAMICS OF WASTE ACCUMULATION: DISPOSAL VERSUS RECYCLING,
For primary bibliographic entry see Field 05G.
W73-10739

5F. Water Treatment and Quality Alteration

APPARATUS FOR MONITORING AND CONTROLLING HALOGEN LEVELS IN A WATER TREATMENT SYSTEM,
Halogen Controls, Inc., Barrington, Ill. (assignee).
D. P. DeVale.
U. S. Patent No. 3,724,474, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 132, April 3, 1973.

Descriptors: *Patents, *Water supply, *Water treatment, Water quality control, *Halogens, Pollution abatement, Water pollution control, Chemical reactions, Waste water treatment.
Identifiers: *Chemical treatment.

An improved method and apparatus are described for measuring and controlling the halogen content of water. A pair of electrodes are placed in the water undergoing treatment. A capacitor is connected across the electrodes. A high input impedance detection circuit is used to determine when the voltage across the capacitor has decreased to a predetermined level and chlorine is added to the predetermined level. The halogen (chlorine usually) content is detected on a continuous fluid flow, dynamically sensed basis. (Sinha-OEIS)
W73-10593

MACHINE FOR REMOVING SEDIMENTARY MATERIAL FROM FILTER BEDS,
Gewerkschaft Eisenhuette (West Germany). (assignee)
H. Wegmann, K. U. Smula, L. Bartz, and W. Stoltefuss.
U. S. Patent No 3,720,299, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 908, No 2, p 357, March 13, 1973.

Descriptors: *Patents, *Filtration, Water supply, *Sediments, Rivers, Water quality control, Water pollution control, *Water treatment, Water purification, Pollution abatement, *Skimming, *Waste water treatment.

The machine comprises a chassis, means for moving it, and means for skimming an upper layer of material as the chassis moves, and a means for conveying the material from the skimmer. The machine is run on endless tracks. It supports a displaceable front frame carrying an inclined conveyor holding circulated buckets. A rotatable drum with projecting paddles or bars projects material in a trough which feeds the buckets. An inclined plate skims a layer of material from the bed as the machine advances and the drum picks up the material from the plate. Another conveyor extends transversally of the chassis and receives material from the inclined conveyor for subsequent discharge from the machine. (Sinha-OEIS)
W73-10602

WATER-SOFTENING UNIT,
National Waterpure Corp., Fallsington, Pa. (assignee)

S. Borochaner.
U. S. Patent No 3,719,594, 3 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 172, March 6, 1973.

Descriptors: *Patents, *Water treatment, *Water softening, Water quality control, *Demineralization, *Ion exchange, Resins.
Identifiers: *Regeneration chambers.

This water softening unit comprises a housing having an ion exchange chamber and a regeneration chamber. The first chamber contains the ion exchange resin for softening water. The regeneration chamber is adapted to selectively contain regeneration material for regenerating the resin as necessary. A conduit extends from the top of the ion exchange chamber and is connected by coupling to a spicket positioned outside the housing. A second conduit leads from the bottom of the chamber upward into the regeneration chamber. An important feature of this sytem is the mounting of the regeneration chamber above the ion exchange chamber and the spicket. This permits the water to flow by simple gravity operation. (Sinha-OEIS)
W73-10604

WATER PURIFYING DEVICE,
J. Astil.
U. S. Patent No 3,719,593, 5 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 172, March 6, 1973.

Descriptors: *Patents, *Reverse osmosis, *Water purification, Water quality control, *Waste water treatment, *Water treatment.

A reverse osmosis device is used to process feed water under line pressure. The purified water is accumulated in a compressible container and is then led to an outlet. The use of the feed water causes an increased feed water flow through the reverse osmosis device flushing it out. A bleed drain drains off the feed water that is then used to compress the compressible container returning the system to the water purifying and storage condition after delivery of the product water. (Sinha-OEIS)
W73-10605

FILTRATION PROCESS FOR CLARIFICATION,
Erbara-Infilco Ltd., Tokyo (Japan). (Assignee)
Y. Hayashi, and A. Obara.
U. S. Patent No 3,719,592, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 171, March 6, 1973.

Descriptors: *Patents, *Filtration, *Coagulation, *Water treatment, *Sedimentation, Turbidity, Waste water treatment.
Identifiers: Aluminum sulfate, *Clarification (Water).

The filtration process consists of adding about 3 - 5 ppm aluminum sulfate to suspended water having a turbidity of less than 100 ppm at a time not more than 1 minute before the suspended water is applied to a filter. The rate of filtration is 10 - 40 m/hr and during the filtering an additional quantity of aluminum sulfate is added until the filtered water is stabilized. (Sinha-OEIS)
W73-10606

CONCENTRATION OF VIRUS FROM WATER BY ELECTRO-OSMOSIS AND FORCED-FLOW ELECTROPHORESIS: II. IMPROVEMENT OF METHODOLOGY AND APPLICATION TO TAP WATER,
Gulf South Research Inst., New Orleans, La. Public Health Science Div.
R. D. Ellender, F. Morton, J. Wheland, and B. H. Sweet.
Prep Biochem. Vol 2, No 3, p 215-228. 1972. Illus.
Identifiers: *Electro osmosis, *Electrophoresis, Flow, Methodology, Osmosis, *Virus, *Potable water, Water treatment.

The ability of the Canalco Model CF-3 electro-osmosis (EO) apparatus to concentrate viruses from artifically seeded distilled water was improved. Modification of the physical arrangement of the equipment allowed for a 10-25 fold increase in concentration efficiency and a concomitant decrease in the process time. The major improvements involved modifications of the cell arrangement (which increased the membrane transport area), a change in the salt replenishing solution and the use of different membranes of higher flux. Viruses concentrated by EO from seeded tap water resulted in lower recoveries when compared to distilled water. The lower yields were probably due to instability or aggregation of the agents in the menstruum. One could detect viruses at levels as low as 0.01 plaque forming units/ml of initial input. The efficacy of a modification of the Canalco forced flow electrophoretic system was also evaluated. The maximum potential was applied with a constant value for pump rates. A 6-fold concentration of virus and a 12-fold decrease in water volume was obtained. The technique may be applied to the determination of viral flora of natural, processed and recreational waters. (See also W73-03176)—Copyright 1973, Biological Abstracts, Inc.
W73-10817

5G. Water Quality Control

THE ORIGIN, EFFECTS AND CONTROL OF TURBIDITY IN AN URBAN RECREATIONAL LAKE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W73-10406

MOBILIZATION AND PARTICIPATION OF CITIZENS GROUPS IN IMPROVING THE QUALITY OF WATER RESOURCES ENVIRONMENTS,
Minnesota Univ., Minneapolis. Dept. of Anthropology.
For primary bibliographic entry see Field 06B.
W73-10409

EFFECTS OF MOSQUITO CONTROL DITCHING ON ESTUARINE ECOSYSTEMS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
E. J. Kuenzler, and H. L. Marshall.
Available from the National Technical Information Service as PB-220 951, $3.00 in paper copy, $0.95 in microfiche. North Carolina University Water Resources Research Institute Report No 81, February 1973. 83 p, 15 fig, 14 tab, 49 ref, append. OWRR B-026-NC (1). 14-31-0001-3315.

Descriptors: Environmental effects, Ecology, *Estuarine environment, *Drainage, Mosquitoes, *Ditches, *North Carolina, *Salt marshes, Wetlands, Marsh management.
Identifiers: *Mosquito Control, Estuarine ecosystems.

Large areas of irregularly flooded North Carolina salt marsh dominated by Juncus roemerianus have been ditched in an attempt to control mosquito breeding. Comparative study of ditched and unditched marshes at three locations in N.C. was carried out to determine the extent of ecological changes. Ditches increase the area of aquatic habitat in marshes by a factor of 5, are inhabited bylarge numbers of juvenile fishes, crabs, and shrimp and increase the amount of nursery ground for fish and crustaceans. Animal variety in ditches is low. Oysters planted in the ditches did not grow well. It is unlikely that oysters or shrimp could be cultured successfully on a commercial basis in ditches. Marshes were flooded 10-28% of the time. Fiddler crabs were present on all marshes. During flood tides fishes occur on both ditched and unditched marshes. Except for the direct effects of the spoil piled on top of the marsh during ditching, large changes were evident in the density and growth of Juncus. Brushy vegetation invaded many spoil piles and along ditches. Invasion continued druing the two year study. Failure of vegetation to significantly cover many spoil piles after eight years, and continuing erosion of spoil piles to form water-retaining levees along ditches is cause for concern. Moratorium on ditching is recommended pending further research on effectiveness for mosquito control and ecological effects.
W73-10410

PUBLIC PARTICIPATION IN WILLAMETTE VALLEY ENVIRONMENTAL DECISIONS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
C. L. Smith.
Available from the National Technical Information Service as PB220 953, $3.00 in paper copy, $0.95 in microfiche. Oregon Water Resources Research Institute Report WRRI-15, April 1973. 148 p, 8 fig, 18 tab, 81 ref. OWRR B-023-ORE (2).

Descriptors: *Decision making, Environmental effects, Water pollution control, Social values, *Oregon, Attitudes, *Water quality.
Identifiers: *Willamette River (Ore), *Public participation, Interest groups, Lobbying.

In the summer of 1969 the water quality of the Willamette River reached a level suitable for most human and wildlife uses for the first time in nearly 60 years. This water quality enhancement program had been undertaken 30 years earlier when those closely associated with the river were successful in arousing public interest in the deteriorated quality of the river. These two events in the Willamette Valley were not attributable to the urban oriented environmentalists. They were the result of over 30 years of deliberation, debate, and decisions worked out in accordance with the broad variety of self-interests which prevailed among Willamette Valley citizens. Self-interest, energized by emotional commitment, was a critical element as groups argued one side or the other of such dilemmas as growth and no growth, management of the environment by man an management by nature, diversity and similarity of actions, elitism and broad participation in decision-making, centralization and decentralization of authority, and generalization and specialization of interests.
W73-10412

IMPREGNATION OF CONCRETE PIPE.
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 08G.
W73-10419

INFLUENCE OF WATER QUALITY IN MAINTAINING WHITENESS WHEN LAUNDERING WHITE FABRICS,
North Dakota Univ., Grand Forks. Dept. of Textiles and Clothing.
C. M. Janecek.
Available from the National Technical Information Service as PB-220 968, $3.00 in paper copy, $0.95 in microfiche. North Dakota Water Resources Research Institute, Fargo, Report WI-221-015, September 1971. 12 p. OWRR A-020-NDAK (3).

Descriptors: *Laundering, *Textiles, *Fabrics, *Testing, Water quality, Effects, Testing procedures, Cotton, Water types, Hardness (Water), Color, Water properties, Water analysis, Organic matter, Water pollution effects, Water softening.
Identifiers: Fabric whiteness.

The first phase of this study considered how hardness, iron, and manganese affected white cotton test fabric in the laundry process. The second phase was concerned with the effects of organic coloring and minerals on the test fabric. Swatches were prepared from the fabric and laundered by cooperators. The swatches were analyzed in the textile laboratory before laundering and after 1, 5, 10, 15, and 20 launderings. Fabric discoloration and changes in physical properties were considered. Hot and cold water samples were analyzed from each water system. The results of phase one indicated that: there was not a seasonal change in the waters sampled; water conditioning equipment was not functioning properly in a number of cases; fabric laundered in hard waters containing iron and manganese became discolored during the first laundering and the discoloration increased with repeated launderings; and that tensile strength decreased for fabrics laundered in very hard water. In phase two white cotton test fabric was laundered in waters containing organic coloring and minerals, then compared to the same kind of fabric laundered in clear, softened water. Statistically, discoloration was significant, but there was no significant difference in strength loss for the fabrics laundered in the organically colored water. (Woodard-USGS)
W73-10420

DEEP WATER RENEWAL IN SAANICH INLET, AN INTERMITTENTLY ANOXIC BASIN,
Washington Univ., Seattle. Dept. of Oceanography,
For primary bibliographic entry see Field 05B.
W73-10432

OILY WATER SEPARATION SYSTEM,
Esso Research and Engineering Co., Florham Park, N.J.
R. J. Skocypec.
Available from the National Technical Information Service as COM-72-10561, $4.50 in paper copy, $0.95 in microfiche. Final Report No. EE2TMR.72, January 1972. 54 p, 18 fig, 20 tab, 2 append. Project No. Task II, Sub-Task 3. Contract No. C-1-35049.

Descriptors: *Oily water, *Separation techniques, *Filtration, Oil, Oil wastes, Water pollution control.
Identifiers: *Ballast water, Performance evaluation, Esso coalescer, Cuno filter, Oil removal, Particulate matter.

An oily water separation system for marine use consisting of an AMF-Cuno Super Auto-Klean Filter (Model AK-511) upstream of an Esso Coalescer was evaluated. The Cuno-Filter was evaluated as a unit for particulate removal while the Esso Coalescer was evaluated as an oil removal device. The system's effectiveness was highly inconsistent due to plugging of the coalescer by wax. The best performances achieved were with two coalescers in series downstream of a surge tank for gross oil removal. Oil removal efficiencies were near 90 percent for these tests over a wide range of influent oil contents. The Cuno-Filter was unsuccessful in removing particulates in this application. However, it should be noted that the Cuno filter was not specifically designed for this application. General application of this type of coalescer where a highly polished effluent is desired is discouraged for dirty ballast water treating because of wax plugging which makes the coalescer inoperative. The coalescer is, however, recommended for removing oils with known low wax contents. Plugging due to suspended solids is not thought to be significant. (Little-Battelle)
W73-10535

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME 1.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-10556

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-10557

NITRATE REDUCTION IN THE VICINITY OF TILE DRAINS,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-10560

THE ECONOMIC EFFECTS OF PAWTUCKAWAY STATE PARK: V. EFFECT OF PARK USE ON ENVIRONMENTAL QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W73-10562

INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL,
United Nations Inst. for Training and Research, New York.
D. Serwer.
In: Law, Institutions, and the Global Environment. Oceana Publications, Inc., Dobbs Ferry, New York. p 178-207. 1972.

Descriptors: *Water pollution control, *Air pollution, *Land management, *International law, *Technology, *Standards, *Costs, Regulation, Permits, Compensation, Planning, Forecasting.
Identifiers: *Liability, *Registration, *Licensing, Subsidies.

International means of controlling pollution of land, sea, and air are described. Protection, discharge, and technological standards, complete prohibitions, effluent charges, and price adjustments are discussed. Measures promoting compliance include liability, registration, licensing, technical assistance, subsidies, compensation, planning, and forecasting. (Ensign-PAI)
W73-10566

INTERNATIONAL ENVIRONMENTAL CONTROLS IN THE SCIENTIFIC AGE,
Columbia Univ., New York. Inst. for the Study of Science in Human Affairs.
Z. Slouka.
In: Law, Institutions, and the Global Environment. Oceana Publications, Inc., Dobbs Ferry, New York. p 208-236. 1972. 56 ref.

Descriptors: *Environmental control, *International law, *Management, Technology, *Research, Data collections, Data transmission, Economics.

The roles of science and technology in international environmental management are discussed. Efforts to create new global norms and institutions for environmental control by slow traditional means cannot be relied upon as primary mechanisms for environmental management unless they are accompanied by decisive international responses to environmental issues on regional and bilateral levels. The use of global institutions is compared to that of more fragmented systems, and collection and dissemination of data and economics are considered. Experience derived from international management of the oceans is reviewed. (Ensign-PAI)
W73-10567

THE IMCO EXPERIENCE,
Intergovernmental Maritime Consultative Organization, London (England). Legal Div.
T. A. Mensah.
In: Law, Institutions, and the Global Environment. Oceana Publications, Inc., Dobbs Ferry, New York. p 237-252. 1972. 8 ref.

Descriptors: *Oceans, *Water pollution control, *International law, Water pollution, Air pollution, Land management, Ships, Oil spills, Pollutants, Organizations, Legal aspects.

The activities of the Inter-Governmental Maritime Consultative Organization (IMCO) related to prevention of marine pollution are summarized. IMCO is concerned with contamination of the sea, land, and air by ships and other equipment operating in the marine environment, and it is particularly interested in preventing spills of oil and other noxious substances. The institutional and legal frameworks of the organization are described, and operative bodies within the organization are discussed, including the Maritime Safety and Legal committees. (Ensign-PAI)
W73-10568

THE POTENTIAL OF REGIONAL ORGANIZATIONS IN MANAGING MAN'S ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
R. E. Stein.
In: Law, Institutions, and the Global Environment. Oceana Publications, Inc., Dobbs Ferry, New York. p 253-293. 1972. 143 ref.

Descriptors: *Environmental control, *International waters, *Governments, Inter-agency cooperation, Management, Organizations, International Joint Commission.
Identifiers: Regional-Global organizational relationships.

A description is given of the study, catalyst, and management functions of various intergovernmental organizations dealing with international environmental problems. The ways in which agencies deal with oil pollution of the oceans are explained along with the activities of the International Joint Commission. The relationship of regional organizations to global organizations is explored. (Ensign-PAI)
W73-10569

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHINGTON, D.C. 2-3 JUNE 1971.

National Security Industrial Association, Washington, D.C. 266 p, 1971.

Descriptors: *Environmental control, Programs, *Federal government, *State Governments, *Local governments, Natural resources, Protection, Mapping, Charts, Water pollution, Air pollution, Water quality, Pollution abatement, Coasts, Management, Ships, Operations, Industries, Fishing, Oil, Chemicals, Mining, Recreation.

Federal, state, and regional programs concerned with the marine environment were described at the 1971 annual meeting of the ocean science and Technology Advisory Committee. These include programs on ocean resource protection; mapping, charting, and geodesy; environmental prediction and atmospheric services; pollution prevention; air pollution; water quality; coastal zone management; and ship operations. In addition, the current status of the chemical, fishing, petroleum, marine recreation, and marine mining industries is discussed. (See W73-10571 thru W73-10578) (Ensign-PAI)
W73-10570

DEPARTMENT OF INTERIOR PROGRAM,
Bureau of Outdoor Recreation, Washington, D.C.
C. D. Hofe, Jr.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p II-28-II-35, 1971.

Descriptors: United States, *Federal government, *Coasts, *Estuaries, *Management, *Resources development, Programs, Wildlife, Fisheries, Regulations, Waste disposal, Dredging, Land fills, Recreation, Water quality, Circulation, Hydrology, Water pollution control, Mining, Exploitation, Oil, Operations.
Identifiers: *Department of Interior.

Coastal zone management and resource development programs of the Dept. of the Interior are discussed. The National Park Service administers 54 coastal zone areas, and the Bureau of Sport Fisheries and Wildlife conducts studies designed to improve anadromous fish populations. In addition, the Bureau operates fish hatcheries and has National Wildlife Refuges located in estuaries and on coastal islands. The Bureau also reviews applications for permits to dredge, fill and to discharge refuse in navigable waters. The Bureau of Outdoor Recreation is concerned with the development of coastal areas for recreation purposes, and the Geological Survey carries out research on water quality, circulation, hydrology, and pollution control. The Survey also maps continental margins and performs geologic and geophysical surveys. The Bureau of Land Management is concerned with the development of marine mineral resources, oil and gas leasing, and the environmental impact of mineral exploitation. The Bureau of Mines deals with offshore petroleum operations as well as dredging activities. (See also W73-10570) (Ensign-PAI)
W73-10571

FEDERAL INTERACTION WITH STATES,
Virginia Inst. of Marine Sciences, Gloucester Point.
W. J. Hargis, Jr.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-1 - III-10, 1971.

Descriptors: *Coasts, *Planning, *Management, Federal government, State governments, Local governments, *Governmental interrealtions, *Resources development, *Water quality, Zoning, Easements, Taxes, Permits, Licenses, Leases, Standards.

The development of a national coastal zone mangement program is proposed in order to preserve the quality of the oceans. Effective management of man's activities, ingress and egress, offloading and onloading, and transfer from international to interstate commerce would permit control of the resources and quality of the seas and coastal zones. A variety of complex management techniques should be used rather than a control model approach. Land planning and management, zoning, easements, tax relief, user permits, and dredging and filling licenses are suggested, along with fishery and mineral leasing, water uses and discharge permits, and water quality standards. There should be state and local involvement in the federal program, and all efforts should be coordinated. (See also W73-10570) (Ensign-PAI)
W73-10572

LONG ISLAND'S APPROACH TO ENVIRONMENTAL QUALITY,
Ocean Systems, Inc., Reston, Va.
E. C. Stephan.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-13 - III-17, 1971.

Descriptors: *Sounds, *Water quality control, Research, *Oceanography, Waste disposal, *Wetlands, *Management, Dredging, Landfill, Beaches, Stabilization, Standards, Industry, Agriculture, Waste water disposal, Waste water treatment, Technology, Thermal pollution, Ecology, *New York.
Identifiers: *Long Island.

Actions taken by the Nassau-Suffolk Regional Planning Board to preserve and enhance the quality of Long Island's marine environment are discussed. Oceanographic research has been carried out, along with studies on waste water disposal and groundwater replenishment; wetland management; dredging and dredge spoil placement; and beach stabilization and replenishment. Development of effluent standards for municipalities, industry, and agriculture is suggested, along with development of baselines to establish the extent of man's alteration of the environment and creation of sound waste water treatment and disposal technology. In addition, increased understanding of wetlands and their role in ecology and of thermal pollution from power plants is needed. (See also W73-10570) (Ensign-PAI)
W73-10573

DELAWARE MARINE RELATED STUDY,
Hercules, Inc., Wilmington, Del.
R. W. Cairns.
In: Proceedings 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-18 - III-24, 1971.

Descriptors: *Delaware, *Coasts, *Seawater, *Water quality control, Projects Development, Construction, Regulations, Permits, Legislation, Management, State govenments.
Identifiers: Public hearings, Prohibition measures.

Recommendations for ways to preserve and improve the quality of Delaware's marine and coastal environments are discussed. Environmental impact statements and public hearings on all major development projects in the coastal zone are suggested, along with prohibition of industrial development along the shoreline and building of deep water ports. In addition, a moratorium on permits for piers, docks, and structures that would intrude on the coastline is proposed, and more permanent coastal zone legislation is suggested. The possibility of centralizing management and responsibilities in the state is explored. (See also W73-10570) (Ensign-PAI)
W73-10574

THE GULF ENVIRONMENTAL PROGRAM,
Gulf Universities Research Corp., Galveston, Tex.
J. M. Sharp.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-25 - III-41, 1971.

Descriptors: *Gulf of Mexico, *Continental shelf, *Coasts, Research, Energy, Geochemistry, Trace elements, Oil, Pesticides, Organic matter, Chemical analysis, Sedimentation, Mineralogy, Biology, Synoptic analysis, Management, Economics, Water quality control.
Identifiers: *Barataria Bay, *Subsystem interrelations.

Environmental properties and processes, chief flows of energy mass, and momentums, and principal activities of man in five subsystems of the Gulf of Mexico are considered. These subsystems include coastal and continental shelf areas of the NE, N central, NW, and southern parts of the Gulf and the open Gulf which interconnects the four coastal/continental shelf subsystems. Direct interaction and interdependence of these subsystems is recognized. Synoptic investigations in Barataria Bay are described; these include geochemical, trace element, hydrocarbon, pesticide, and organic chemical analysis, along with determinations of mineral content, sediment texture and structure, and biology. Coastal zone management and economics are also considered. (See also W73-10570) (Ensign-PAI)
W73-10575

REPORT OF STUDY ON SHIPS CHANNELS AND HARBORS,
American Association of Port Authorities, Washington, D.C.
A. Hammon.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-49 - III-51, 1971.

Descriptors: *Atlantic Ocean, *Coasts, *Maine, *New Jersey, *Delaware, *Harbors, Facilities, Ships, Water pollution, Recreation, Cities, Pollution abatement, Cleaning, Protection.
Identifiers: Supertankers, *Port facilities.

Development of public, deepwater port facilities for supertankers carrying petroleum is discussed, with emphasis on the North Atlantic. Private supertanker terminal plans off northern Maine, and New Jersey, and in Delaware Bay have run into considerable local resistance because of the fear of oil pollution. The coastline is well developed for recreational and residential uses and also serves as a fishing ground. Supertanker transshipment terminals and vessels must offer the utmost in pollution prevention and oil containment and removal equipment, along with financial protection to surrounding shore communities. (See also W73-10570) (Ensign-PAI)
W73-10576

CALIFORNIA'S MARINE PROGRAM,
Modern Management, Beverly Hills, Calif.
J. J. Moore.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-53 - III-66, 1971.

Descriptors: *California, *Coasts, *Protection, *Management, *Legislation, Resources, Economics, Technology, Administration, Research and development, Water pollution control.

Coastal zone management programs undertaken in California are discussed, along with legislation for protecting California's marine and coastal environments. Economics of ocean resource development, demographic pressures within the coastal zone, environmental concerns, disenchantment with technology, and loss of confidence in administrative officials have encouraged legislation. Regional commissions for coastal zone management have been suggested, along with a moratorium on all coastal development until 1975. (See also W73-10570) (Ensign-PAI)
W73-10577

CHEMICAL PANEL REPORT,
Union Carbide Corp., New York.
J. S. Whitaker.
In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p IV-9 - IV-16, 1971.

Descriptors: *Chemical industry, *Chemical wastes, *Waste disposal, Oceans, Land, Air, Hazards, *Water pollution control, Control systems, Protection, Equipment, Materials, Treatment facilities, Programs, Research and development, Transportation, Education.

Efforts made by the chemical industry to reduce the quality of its wastes and to make other wastes more acceptable to the receiving environment, particularly ocean and coastal areas, are discussed. The chemical industry needs the ocean

as a receptor for its toxic wastes which create greater hazards when disposed to land, air, or surface waters; however, the industry is opposed to indiscriminate dumping. The industry has changed raw materials, improved catalysts, changed starting and intermediate materials, altered equipment, and substituted one product for another. Terminal treatment with conventional hardware has also been employed. In addition to treating facilities, the industry has environmental protective research and development programs. An environmental hazard center which dispenses information on emergencies arising during transport and handling of chemicals is being established, and educational programs have been created. (See also W73-10570) (Ensign-PAI)
W73-10578

OCEAN UTILIZATION AND COASTAL ZONE DEVELOPMENT.
Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
For primary bibliographic entry see Field 02L.
W73-10579

POLLUTION OF THE MARINE ENVIRONMENT AND THE EFFECTS THEREFROM: THE CASE FOR STRICTER ENFORCEMENT,
York Univ., Downsview (Ontario). Faculty of Environmental Studies.
For primary bibliographic entry see Field 05C.
W73-10581

METHOD OF DECONTAMINATING AN ORGANOPHOSPHORUS INSECTICIDE,
Department of the Air Force, Washington, D.C.
B. C. Wolverton.
U. S. Patent No. 3,725, 269, 2 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 315, April 3, 1973.

Descriptors: *Patents, *Insecticides, *Organophosphorus pesticides, Water pollution control, Water quality control, Chemical reactions, *Solvents, *Pollution abatement.

The method of decontaminating an organophosphorus insecticide comprises two steps. (1) Exposing the insecticide in a volume-to-volume ratio of ten parts of decontaminant to one part insecticide. The decontaminant being 12.5% - 25% by volume of monoethanolamine in dipropylene glycol monomethyl ether as a solvent. (2) The exposure is continued for at least 30 minutes. (Sinha-OEIS)
W73-10583

CONTROL OF OIL POLLUTION AT SEA, APPARATUS AND METHOD,
A. J. Ortiz.
U. S. Patent No. 3,724,662, 10 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 178, April 3, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Leakage, *Seepage control, Oceans, Water quality control, Water pollution control, Equipment, *Pollution abatement.

The control of a leak or spill of oil is accomplished by the use of a huge plastic bag. The bag is of an inverted tear-drop shape with its small end serving as its mouth. The large end is closed except for hose connections for removal of accumulated oil to be transferred to a reservoir. Oil flows from the source into the bag and is pumped to the reservoir. The plastic bag is rolled from its pre-folded position and is pulled underwater by frogmen. Once the mouth has been positioned and anchored, the seal at the throat is released and oil is then allowed to flow into the body of the bag. (Sinha-OEIS)
W73-10591

FLOATING FIRE EXTINGUISHING APPARATUS AND CATCH BASIN,
R. J. Chiasson, R. G. Bourg, and T. J. Arceneaux.
U. S. Patent No. 3,724,555, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 151, April 3, 1973.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, *Pollution abatement, Water quality control, Water pollution control.
Identifiers: *Fire extinguishers, Oil rig fires.

A floating fire extinguishing apparatus and catch basin smother offshore oil rig fires and prevent oil pollution. The apparatus is a U-shaped hull which can be manipulated to enclose a burning rig and smother the fire. Pumps mounted on the structure spray water over the burning rig to assist in putting out the fire and cool the rig. Interconnected pressure relief vents are provided to relieve internal pressures. An annular space defined by the enclosing structure in the water provides a catch basin for the containment of the liquid hydrocarbon liquids. (Sinha-OEIS)
W73-10592

METHOD FOR SEPARATING OIL FROM WATER SURFACE,
Ocean Design Engineering Corp., Long Beach, Calif. (assignee).
R. E. Hunter.
U. S. Patent No. 3,723,307, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 1115, March 27, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Water quality control, Water pollution control, *Pollution abatement.
Identifiers: *Wave action, Foam material.

Small buoyant bodies of flexible foam material are distributed over the oil floating on the surface of the water. The foam material is lifted and compressed to remove the oil and then returned to be used again. Booms are used for gathering the bodies of foam material toward a conveyor which lifts the material upward. The booms are articulated and include floats so that the booms rise and fall with wave action. (Sinha-OEIS)
W73-10595

APPARATUS FOR SKIMMING OIL,
Gulf Oil Corp., Pittsburgh, Pa. (assignee).
B. Stenstrom.
U. S. Patent No. 3,722,690, 4 p , 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 970, March 27, 1973.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, Water quality control, Water pollution control, *Pollution abatement, *Skimming.
Identifiers: *Oil skimmers.

This collapsible flotation buoy is intended for skimming an oil layer from water in a tanker so ballast water will not pollute ocean water. The buoy is provided with mechanical folding arms for collapsing the buoy, permitting its insertion into a narrow opening at the top of the tank. The folding arms are remotely controlled to permit expansion of the buoy for use when it is inside the tank. (Sinha-OEIS)
W73-10596

SEA-SURFACE OIL EXTRACTOR,
Reynolds Submarine Services Corp., Miami, Fla. (assignee).
R. F. Wirsching.
U. S. Patent No. 3,722,688, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 969, March 27, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Skimming, Equipment, Water quality control, Water pollution control, *Pollution abatement.
Identifiers: *Oil skimmers.

This oil skimmer carries its own ballast. A flexible skirt is used to form the wall of a sump compartment surrounding the ballast chamber. There is a weir arrangement by means of which the apparatus skims the contents of the surface of the sea. A pump within the sump compartment helps remove the surface layer while the cleaned water is led out from the lower region of the compartment. (See also W73-10598) (Sinha-OEIS)
W73-10597

APPARATUS FOR EXTRACTING OIL OR THE LIKE FROM THE SURFACE OF THE SEA,
Reynolds Submarine Services Corp., Miami, Fla. (assignee).
A. L. Markel, and R. F. Wirsching.
U. S. Patent No. 3,722,689, 4 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 969, March 27, 1973.

Descriptors: *Patents, *Skimming, *Oil spills, Oil pollution, Equipment, Water quality control, Water pollution control, *Pollution abatement, *Weirs.
Identifiers: *Oil skimmers.

This invention uses a self-compensating weir arrangement disclosed in the copending application of R. F. Wirsching. The sump compartment is made sufficiently large so as to obtain deceleration of the flow of liquids which pass over the weir member. Vanes are used to generate a vortex within the sump compartment. The latter is made large enough so that a quiescent condition is obtained for the liquids therein. Oil obtained from the inner weir is pumped to a collecting vessel. (See also W73-10597) (Sinha-OEIS)
W73-10598

FLOATING OIL SKIMMING APPARATUS WITH OIL AND WATER SEPARATOR,
G. B. Stebbins, J. F. Stebbins, and J. G. Becker.
U. S. Patent No. 3,722,687, 5 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 969, March 27, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Skimming, *Pollution abatement, Equipment, Water quality control, Water pollution control.
Identifiers: *Oil skimmers.

A novel floating oil skimmer continuously removes a floating oil and water mixture from the surface of a body of water and conditions the mixture for easy separation. The platform has a flat upper surface and an upstanding peripheral weir at its outer edge. The mixture flows over the weir toward the center of the platform where a second weir surrounds a sump. There is a centrifugal pump in the center of the sump. It aerates the mixture and transfers it to the top of a separating tank. Air and water rise while water at the bottom of the tank is continuously removed. (Sinha-OEIS)
W73-10599

OIL SPILLAGE DETECTION SYSTEM,
Durham Associates, Inc, Lynnfield, Mass. (assignee)
R. H. Daniels, and J. G. Zahka.
U. S. Patent No 3,719,936, 5 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 246, March 6, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, Equipment.
Identifiers: *Oil sensors, Sensing.

A housing is adapted to be placed in a partially submerged buoyant state in a body of water. It has one or more input ports to permit entry of water and any oil which may be on the surface of the water. A selectively transmissive member is provided within the housing in a position exposed to the oil-water interface and operates to transmit the

oil. A sensor in one chamber within the housing detects the presence of oil. The sensor may be a resistance temperature dependent electrical thermometer or the sensor can be mechanically actuable by the weight of oil within the chamber to cause an output indication. The oil chamber can be removable for collection purposes. The system can also include a means for releasing a coalescing agent which combines with oil to provide for easier removal. A marking material can also be released to visually mark the spillage site. (Sinha-OEIS)
W73-10603

CONSTRAINTS IN WATER MANAGEMENT ON AGRICULTURAL LANDS,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 03F.
W73-10621

ESTABLISHING PRIORITIES IN MINE DRAINAGE REDUCTION, A COST-EFFECTIVENESS APPROACH,
Corps of Engineers, Baltimore, Md. Planning Div.
J. E. Crews.
Water Resources Bulletin, Vol 9, No 3, p 567-576, June 1973. 3 fig, 6 tab, 2 ref.

Descriptors: Water resources, Planning, *Water pollution control, *Acid mine water, Drainage, Watersheds (Basins), Methodology, Cost allocation, Streams, New York, Pennsylvania, Estimating, Optimization, Cost-benefit ratio, Lime, Neutralization, Water quality, Water supply, Systems analysis, Mathematical models, *Cost analysis, *Mine drainage.
Identifiers: *Cost-effectiveness, Cost minimization, *Susquehanna River basin, *Tioga River (Pa).

Twenty-seven watersheds in Susquehanna River Basin territory are severely degraded by acid mine drainage pollution. Approximately 620 miles of significant tributaries as well as 230 miles of principal rivers are either sterile or intermittently degraded by acid slugs. As a result of acid discharges, many uses of the streams, such as water supply and recreation, are rendered ineffectual. In past attempts at acid mine drainage abatement, programs did not look beyond the immediate problem area; no considerations were given to the blending effect of natural alkalinity in other streams. Since abatement of acid mine drainage pollution is extremely costly, a method of minimizing these costs has been devised. The systematic, cost-effectiveness approach is discussed. A case study of the Tioga River (Pa) is presented, and a mathematical model developed by the Baltimore District Corps of Engineers to optimize the system of abatement measures under objectives of improving water quality in the defined Tioga River reaches is described. By using the systematic, cost-effectiveness approach, water resources planners can control the allocation of funds for maximizing the abatement of acid mine drainage. (Bell-Cornell)
W73-10624

DEVELOPMENT OF DESIGN STORM HYETOGRAPHS FOR CINCINNATI, OHIO,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02B.
W73-10679

OIL ON PUGET SOUND, AN INTERDISCIPLINARY STUDY IN SYSTEMS ENGINEERING,
Washington Univ., Seattle. Coll. of Engineering.
For primary bibliographic entry see Field 05B.
W73-10684

WATER QUALITY MANAGEMENT PLAN, INTERIM ST. CROIX RIVER BASIN.
Creative Research Services, Inc.

Prepared for Division of Water Quality, Minnesota Pollution Control Agency, St. Paul, 1971. 103 p, 5 fig, 20 tab, append.

Descriptors: *Planning, *Water quality control, Waste water treatment, Water quality standards, Environmental effects, *Minnesota, Treatment facilities.
Identifiers: *Water quality management plan, *St. Croix River Basin (Minn).

This report is one in a series of ten river basin, water quality management plans for the State of Minnesota. These plans represent a significant element in the state's river basin planning capabilities and are intended to meet federal requirements for construction grants for municipal wastewater treatment plants. The report defines the improvement needs for municipal wastewater treatment for the period 1971 to 1980. The main areas of discussion are (1) a description of the river basin including geography, economic activities, and population; (2) information on the water resources of the basin including surface and groundwater, water supplies, and water use; (3) information on water quality with emphasis on stream standards and effluent standards; (4) tables of principal effluent sources; (5) the effects of the effluent discharges on water quality in the basin; (6) an evaluation and priority ranking of treatment needs; and (7) an interim pollution abatement plan including objectives, sewer and treatment plant needs, cost estimates, implementation measures, and probable environmental impact. (Elfers-North Carolina)
W73-10689

EVALUATION OF THE OHIO WATER SUPPLY PROGRAM: SUMMARY.
Environmental Protection Agency, Chicago, Ill. Div. of Air and Water Programs.

Available from the National Technical Information Service as PB-214 058, $3.00 in paper copy, $0.95 in microfiche. July, 1972. 19 p, 2 fig.

Descriptors: *Water supply, *Evaluation, Quality control, Inspection, Regulation, Monitoring, Administrative agencies, *Ohio, *Potable water.
Identifiers: Ohio Public Water Supply Program.

An evaluation of the Ohio Public Water Supply Program in terms of its ability to provide safe, wholesome drinking water deals primarily with state activities related to the regulation and surveillance of community water supplies. The study found that established standards of good practice were not being universally met in the state. For example, many water supply systems were either not meeting drinking water standards, not keeping good records, or not being inspected by state regulatory agencies. State agencies, such as the Department of Health, were generally limited in staff and money and were reluctant to issue orders to correct local deficiencies. It is concluded that Ohio must expand and improve its community water supply program. Specific recommendations include an increased budget and professional staff for surveillance activities, the implementation of annula sanitary surveys of each community water supply, monthly reports from treatment plant operators, the use of automatic data processing techniques, and the creation of new state regulation. (Elfers-North Carolina)
W73-10692

TOWN OF CAIRO WATER SUPPLY REPORT.
Diachishn (A.) and Associates.
For primary bibliographic entry see Field 03D.
W73-10693

WELL OPERATION,
Madison Water Utility, Wis.
For primary bibliographic entry see Field 08A.
W73-10714

THE FEASIBILITY OF FLOW SMOOTHING STATIONS IN MUNICIPAL SEWAGE SYSTEMS,
Research Triangle Inst., Durham, N.C.
For primary bibliographic entry see Field 05D.
W73-10722

APPLICATION OF SELECTED INDUSTRIAL ENGINEERING TECHNIQUES TO WASTE WATER TREATMENT PLANTS,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 05D.
W73-10723

WHAT IS THE ROLE OF FLOOD FLOWS IN THE POLLUTION OF THE CONNECTICUT RIVER AND ITS AMELIORATION,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05B.
W73-10731

SALINITY PROBLEMS OF IMPOUNDMENTS AND THEIR MANAGEMENT,
Agricultural Research Service Chickasha, Okla. Soil and Water Conservation Research Div.
H. B. Pionke, and O. D. Workman.
In: Great Plains Agricultural Council Publication No. 60, Control of Agricultural-Related Pollution in the Great Plains, Seminar, July 24-25, 1972, Lincoln, Nebraska, p 155-167, 6 fig, 5 ref.

Descriptors: *Impoundments, *Water quality, Salinity, *Water management, Routing, Reservoir operation, Diversion, *Great Plains.
Identifiers: *Salinization hazard, *Inflow classification.

Impoundment can cause the salinization of retained or outflow waters, particularly in areas characterized by low rainfall and high evaporation rates as exist in parts of the Great Plains. The realistic control of the salinization associated with impoundment depends on the proper classification of the hazard. Areas classed according to high or low hazard have or require few management options. Those classified as low-hazard could sustain considerable change in salinity without affecting the continued or projected use of the impounded and outflow waters. Conversely, the projected salinity of waters associated with areas classified as hazardous could severely limit or prohibit their use. Where the salinization potential is intermediate, the problem may be managed to minimize a salinity increase without greatly modifying or precluding impoundment. Some of the techniques considered include preferential routing of inflow waters, minor design modifications, relocation of the structure, and the use of evaporation retardants to minimize salinity increase. (ARS).
W73-10734

CSS: A COMPUTER PROGRAM FOR MODELING ECOLOGICAL SYSTEMS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 06A.
W73-10736

DYNAMICS OF WASTE ACCUMULATION: DISPOSAL VERSUS RECYCLING,
V. L. Smith.
The Quarterly Journal of Economics, Vol 86, No 4, p 600-616, November 1972. 5 fig, 15 equ, 11 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Waste disposal, *Recycling, *Pollution taxes (Charges), Economics, Litter, Equations, Model studies, Constraints, Costs, Prices.
Identifiers: *Environmental quality, Scrap value.

UNIVERSITY OF L. URBANA-CHAMPAIGN

A simple control model of the economics of waste recycling is presented. Pollution, litter, or waste disposal is assumed to enter the economic system as a public bad in household utility functions. The resulting subjective cost of using the environment for discharge is not borne directly by those whose decisions result in environmental degradation. The optimal control solution requires a price to be associated with waste discharge, depending upon the accumulated stock of waste, the interest rate, and the rate at which waste decomposes in nature. A competitive decentralized economy is generated by the model when the waste discharge price is identically zero. This corresponds to an unappropriated environment available to all as a free resource for waste discharge. The control solution and the decentralized competitive solution approach the same stationary state equilibrium in two special cases, involving: (1) High private recycling costs; and (2) low private recycling costs. To economists, the natural control device is a Pigouvian system of user charges. Some of the features of a Senate bill designed to institute pollution charges on packaging materials also are discussed. (Bell-Cornell)
W73-10739

PRICING OF POLLUTION: THE COASE THEOREM IN THE LONG RUN,
California Univ., Los Angeles; and National Center for Health Services Research and Development, Rockville, Md.
H. E. Frech, III.
The Bell Journal of Economics and Management Science, Vol 4, No 1, p 316-319, Spring 1973. 8 ref.

Descriptors: *Pollution abatement, *Pollution taxes (Charges), *Industries, Basins, Resource allocation, Market value, Profit, Water pollution, Air pollution, *Cost analysis.
Identifiers: *Coase Theorem.

In an earlier article in this Journal, R. A. Tybout attempted a refutation of the long run applicability of the Coase Theorem. He argued that even in a zero transaction costs model, bribery to reduce pollution and compensation charges for it result in different total profits, and thus in different long-run behavior. This paper demonstrates that Tybout's result is based on a fundamental error in the analysis of costs for the polluting and polluted industries. The property right to the polluted (air or water) basin is a valuable asset with a definite market value. When the rent of this valuable asset is properly included in the costs of the industry holding the right, marginal and total profits are shown to be identical regardless of the assignment of the basin ownership. (See also W72-13559) (Bell-Cornell)
W73-10740

THE SPOILS OF PROGRESS: ENVIRONMENTAL POLLUTION IN THE SOVIET UNION,
M. I. Goldman.
M.I.T. Press: Cambridge, Mass., ; London, England. 1972. 372 p, Illus. Maps. Pr. $7.95.
Identifiers: Aral Sea, Books, Caspian Sea, *Environmental effects, Lakes, Laws, Pollution, Sea, *USSR, Lake Baikal.

Abuses are described of water, air, land and raw materials in Russia, analyzing the forces that have brought about the current situation and describing both the drawbacks and advantages of state control and conservation. Chapters are included on the theory and law of environmental protection in the socialist state and the economic and political propensity to pollute. The effects of Soviet urbanization, industrialization and growing technological prowess on the natural resources of the country are considered in detail. Case studies of how Lake Baikal and the Caspian and Aral Seas were exploited for economic purposes to the detriment of the environment are included. Finally, the genuine advantages of the Soviet system are examined along with some of the implications of Soviet practices for the rest of the world. There is no reason to believe that state ownership of the means of production will necessarily guarantee the elimination of environmental disruption.—Copyright 1972, Biological Abstracts, Inc.
W73-10877

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
D. P. Tihansky.
Copy available from GPO Sup Doc as EP1.23/3:73-017, $3.95; microfiche from NTIS as PB-221 146, $0.95. Environmental Protection Agency, Socioeconomic Environmental Studies Report, EPA-R5-73-017, April 1973. EPA Project 01-AAB-01. Program Element H11094.

Descriptors: *Bibliographies, *Cost Analysis, *Costs, *Water Pollution Control, *Abstracts, Cost comparisons, *Cost-benefit analysis, Economics.

This annotated bibliography is a compilation of the literature on water pollution control costs. It contains nearly 2,000 selected publications, unpublished papers, and theses focusing on the time period from 1960 to 1972, although earlier material is added if it seems particularly relevant. The references are chosen to satisfy the needs and interests of several types of researchers. For the economist, there are books and articles on economic theory and incentive systems in water quality management. For the engineer, there is information on unit treatment processes and cost implications of their design and operation. For the operations research analyst, optimization techniques, mathematical modeling, and statistical methods are referenced as they apply to waste water control. For the policy maker, cost function literature identifies the primary determinants of cost and their quantitative effects. Political and socio-economic issues are also related to water pollution control. (EPA)
W73-10879

INVESTIGATION OF USE OF GEL MATERIAL FOR MINE SEALING,
Dravo Corp., Pittsburgh, Pa.
N. K. Chung.
Copy available from GPO Sup Doc as EP1.23/2:72-135, $1.25; microfiche from NTIS as PB-221 247, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-135, December 1972. 67 p, 27 fig, 11 tab. EPA Project 14010 EKW.

Descriptors: *Acid mine water, *Mine drainage, Abatement, *Sealants, *Gels, Water pollution control.
Identifiers: *Chemical grouts, *Mine sealing.

Laboratory testing of commercially available chemical grouts was conducted to evaluate their potential use, in conjunction with a cheap filler, for remote sealing of mine voids. By close control of the setting time and proper distribution of the grout slurry it was believed that a mine seal could be placed through a borehole from the surface without the benefit of retaining bulkheads. A slurry mix consisting of an acrylamide grout with flyash or mine refuse as a filler was found to produce a strong controllable gel which resisted chemical attack in the laboratory over an eleven week exposure period. An attempt to demonstrate a novel technique for application of the selected grout slurry in a mine entry with high flow was not successful. The results suggest that the technique may be applicable in dry or low flow situations. However, the estimated cost of a mine seal using the gel material is presently not competitive with existing methods.Groundwater monitor wells were drilled for the purpose of determining the effect of mine sealing on groundwater conditions. Data reflecting pre-seal conditions were compiled, but because the sealing of the mine was not completed the monitoring program has been postponed. (EPA)
W73-10880

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STUDY,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-10882

A SEARCH: NEW TECHNOLOGY FOR PAVEMENT SNOW AND ICE CONTROL,
Abt Associates, Inc., Cambridge, Mass.
D. M. Murray, and M. R. Eigerman.
Copy available from GPO Sup Doc as EP1.23/2:72-125, $1.00; microfiche from NTIS as PB-221 250, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-125, December 1972. 54 p, 5 fig, 3 tab, 65 ref. EPA Project Z-800615. Contract No. 68-01-0706.

Descriptors: Water pollution control, Cost-benefit analysis, *Ice, *Snow removal, Snow management, Roads, Equipment, *Deicers, *Heating, Cost analysis, *Highway icing.
Identifiers: *Snow plows.

A study was undertaken to search for new approaches to the problem of snow removal and ice control. Proven techniques of technology transfer were applied for the purpose of identifying technologies that have not yet been utilized for deicing purposes. Contracts with specialists and a 'brainstorming session' were used to determine strategies for search of computerized data banks. Although several approaches were identified, none are immediately useable. Results indicate that: (1) More information is needed on salt damage to the environment, highway structures, and vehicles in order to perform accurate cost-benefit analyses of alternative approaches. (2) More complete knowledge is needed on the effects of alternate chemical deicers. (3) Pavement heating is an expensive means of removing snow and ice but can be justified in special cases for safety or environmental reasons. (4) Two mechanical devices, snow plow with compressed air and a brush and blower system require further testing and development. (5) Research is required to identify a hydrophobic substance which can be applied to pavement to reduce ice adhesion. A brief cost estimate of the various approaches has been included. (EPA)
W73-10883

CONCEPT EVALUATION: RECOVERY OF FLOATING OIL USING POLYURETHANE FOAM SORBENT,
Battelle-Pacific Northwest Labs., Richland, Wash.
C. H. Henager, and J. D. Smith.
Copy available from GPO Sup Doc as EP1.23/2:72-049, $1.50; microfiche from NTIS as PB-221 251, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-049, September 1972. 97 p, 29 fig, 6 tab, 7 ref. EPA Project 15080 HEU. Contract 68-01-0070.

Descriptors: Evaluation, *Oily water, *Separation techniques, Technical Feasibility, Efficiencies, Hydraulic systems, Hydrodynamics, Jets, Testing, Water Pollution Treatment, *Oil spills, Oil pollution, Oilwater interfaces.
Identifiers: *Sorbents, *Polyurethane foams, Equipment development, *Oil recovery.

Individual components of an oil spill recovery system were evaluated using Bunker C oil and three crude oils ranging in API gravity from 14 degrees to 42 degrees. The system was designed to

shred and broadcast polyurthane foam sorbent onto an oil slick, herd the sorbent to a shipside conveyor by a water spray boom, squeeze the sorbent to extract the oil and rebroadcast the sorbent. The initial concept was to build a half-size, full scale system; however, initial foam losses indicated the necessity for a re-evaluation of the program, and specific studies on the broadcasting and 'squeezing' systems were undertaken. The shredder-broadcaster, a commercial straw mulcher, produced acceptable shredding of dry foam. However, multiple cycling degraded oil-soaked foam to unrecoverable sizes in relatively few cycles. With Bunker C oil, 47 percent of the foam was reduced to sizes less than 1/2' in 5 cycles. With light Canadian crude oil, 29 percent was reduced to less than 1/2' in 100 cycles. A sorbent-oil separator using perforated rolls, was designed to extract viscous oils from the foam at 20C, without heating, at rates of up to 5000 gph. This device showed good recovery of oil from foam. Multiple cycling of Bunker C-oil-soaked foam through the full scale device resulted in a small loss of foam by size reduction (3.5 percent in 77 cycles). After 77 cycles of extracting Bunker C oil, foam damage by loss of resiliency reduced oil extraction per cycle to about 25 percent of the initial amount. No loss of resiliency was observed up to about 50 cycles. Because of the high sorbent losses in the shredder-broadcaster, the systems as initially proposed is not recommended for use with Bunker C oil. (EPA)
W73-10884

OPTIMAL FEEDBACK CONTROL - A SYNOPSIS,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 07C.
W73-10887

UNRECORDED POLLUTION SOURCES AND OPTIMUM WATER QUALITY SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W73-10889

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SYNTHESIS AND EVALUATION OF URBAN-REGIONAL HYDROLOGIC RAINFALL-RUNOFF CRITERIA,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 02A.
W73-10416

METHODOLOGICAL IMPROVEMENTS IN MEASURING ECONOMIC EFFECTS OF MULTIPURPOSE WATER RESOURCE PROJECTS.
Berger (Louis), Inc., East Orange, N.J.
For primary bibliographic entry see Field 06B.
W73-10417

(CALIFORNIA COMPREHENSIVE OCEAN AREA PLAN). APPENDIX I: PERMANENT COASTAL ZONE DATA INVENTORY AND INFORMATION SYSTEM,
California State Dept. of Navigation and Ocean Development, Sacramento.
For primary bibliographic entry see Field 07C.
W73-10552

VALUES AND COST ALLOCATIONS OF SURFACE-WATER USE AND TREATMENT,
New Hampshire Univ., Durham. Agricultural Experiment Station.
For primary bibliographic entry see Field 06B.
W73-10558

A SEQUENTIAL DECISION APPROACH IN RECREATIONAL ANALYSIS,
Maryland Univ., College Park. Dept of Civil Engineering.
For primary bibliographic entry see Field 06B.
W73-10619

A PREDICTIVE MODEL FOR UPPER RIO-GRANDE INDEX FLOWS,
Colorado Div. of Water Resources, Denver.
For primary bibliographic entry see Field 04A.
W73-10620

THE DEVELOPMENT OF A PLAN OF STUDY--AN INTERAGENCY APPROACH TO MULTIOBJECTIVE PLANNING AND EVALUATION OF WATER AND LAND RESOURCE USE,
Economic Research Service, Davis. Natural Resource Economics Div.
R. B. McKusick, J. M. Kress, P. G. Ashton, and W. A. Bunter, Jr.
Water Resources Bulletin, Vol 9, No 3, p 467-484, June 1973. 2 fig, 14 ref.

Descriptors: Water resources, *Comprehensive planning, *Alternative planning, Evaluation, *Linear programming, *Inter-agency cooperation, Optimization, Systems analysis, Mathematical models, Natural resources, *Resource allocation, Land use, Demand, Regional development, Agriculture, Forestry, Recreation, Water utilization, Multiple purpose.
Identifiers: *Multidisciplinary approach, Environmental quality, National economic development.

Presented is a systems approach evaluating alternative plans for resource use incorporating the concepts of multiobjective planning and evaluation (MOPE). The need for multidisciplinary input and strong interagency cooperation in planning for resource use is related to the logical and orderly completion of the planning steps. MOPE is described briefly, emphasizing two important concepts: (1) The relationship of the study problems and objectives to national social objectives; and (2) the display of alternative solutions showing tradeoffs. Several important characteristics of a plan of study which implements MOPE are presented and discussed. A proposed MOPE analytical system is discussed in detail. The MOPE analytical system is divided into eight interdependent subsystems that describe data collection, use, analysis, and results. A linear programming model is presented that analyzes the present and future demand relationships for natural resources. The model will also evaluate the interaction of agriculture, forestry, and recreation with the resource base of the basin, considering National Economic Development, Environmental Quality, and Regional Development. (Bell-Cornell)
W73-10622

COMPUTER SIMULATION OF RECREATIONAL BOATING ACTIVITIES,
Army Engineer District, Chicago, Ill. Economics Branch.
A. L. Dietz.
Water Resources Bulletin, Vol 9, No 3, p 494-498, June 1973.

Descriptors: *Simulation analysis, *Computer models, Harbors, *Lake Michigan, *Boating, *Recreation demand, Alternative planning, Evaluation, Probability, Methodology, Systems analysis, Mathematical models.
Identifiers: *Harbor improvement, Travel behavior, Transient, Refuge, Small boat harbors, Predicting.

Lake Michigan provides the necessary conditions for reducing the region's outdoor recreational boating supply deficiency. However, the presence of the Lake itself is not sufficient to solve the deficiency problem because use is strictly controlled by a limited number of access points. A solution is selected site expansion to not only provide access but also service the refuge and transient needs. Harbor improvement planning which identifies the refuge and transient service needs at points along Lake Michigan is considered. The travel behavior model developed to predict this use is sensitive to five criteria: boater characteristics which influence travel behavior; entry rates into the Lake from each access site; site characteristics; weather conditions; and planning parameters. The model estimates: the number of boaters demanding a given access point at a given time; length of stay at that point; probability of travel to specific access sites in given amounts of time; and those facilities used during a specified time period. The simulation modelling boat movement consists of two parts: a traffic generation routine and an activity simulation. The former schedules the entry of boats into the Lake from each site and the latter establishes the probabilistic movement of boats on the Lake. This simulation of interport movements and port activities enables the planner to investigate some impacts of alternative small boat harbor development plans. (Bell-Cornell)
W73-10623

ESTABLISHING PRIORITIES IN MINE DRAINAGE REDUCTION, A COST-EFFECTIVENESS APPROACH,
Corps of Engineers, Baltimore, Md. Planning Div.
For primary bibliographic entry see Field 05G.
W73-10624

A BUDGETING AND LINEAR PROGRAMMING ANALYSIS OF IRRIGATION WATER VALUES IN NORTHERN WYOMING,
Wyoming Univ., Laramie. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-10699

W.A.L.R.U.S. I WATER AND LAND RESOURCE UTILIZATION SIMULATION,
Michigan Univ., Ann Arbor. School of Natural Resources.
A. G. Feldt, D. Moses, and J. Eckroad.
Available from the National Technical Information Service as COM-72-10811, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Program, Technical Report No. 28, The University of Michigan, May, 1972. 69 p, 3 fig, 6 tab, 1 ref.

Descriptors: *Simulation analysis, *Computer programs, *Computer models, *Planning, Water resources, *Land use, *Water users, Environment, Governments, Communication, Economic aspects, Public lands, Public utilities, Sewers, Pollutants, Model studies, Operations research.
Identifiers: *Gaming-simulation.

Presented is WALRUS I, the first in a series of three games developed to provide a basis for communication and interaction among Sea Grant personnel engaged in specialized water resources research and between such personnel and the lay public they are seeking to serve. Successive models in the series will provide gaming-simulation models of increasing complexity and highly sophisticated and realistic simulation of human communities and their interrelationships with the environment. This first game in the series is necessarily quite crude. In a sense, WALRUS I is more of a questionnaire than a simulation model in that it was primarily designed to ask whether or not the

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kinds of factors contained within its framework were the appropriate ones to be considered in dealing with local efforts at water resources planning. The answer has been a qualified 'yes' from a considerable range of persons who have played the initial forms of the model. WALRUS I has proved satisfactory for its basic purposes and to introduce many persons to the use of gaming-simulation models. However, the game is best understood by playing it. (Bell-Cornell)
W73-10735

CSS: A COMPUTER PROGRAM FOR MODELING ECOLOGICAL SYSTEMS,
Oak Ridge National Lab., Tenn.
P. Sollins.
Available from the National Technical Information Service as ORNL-1BP-71-5, $3.00 in paper copy, $0.95 in microfiche. ORNL-1BP-71-5, Aug 1971. 96 p, 5 fig, 13 tab, 7 ref, 3 appen.

Descriptors: *Digital computers, *Computer programs, *Ecology, *Ecosystems, *Simulation analysis, Model studies, Equations, Data collections.
Identifiers: Storage components, Flow functions, Compartment models, Time factor, Dynamic structure.

Two major objectives in the analysis of ecosystems are: (1) Basic research into the mechanisms of ecosystem processes; and (2) prediction of effects of perturbations on the ecosystem and its components. Modeling can be useful in attaining these goals by introducing consistency and order to individual process studies and by allowing the researcher to view the implications of particular hypotheses in terms of the behavior of the overall system. CSS is a digital computer program developed to allow ecologists with minimal training in mathematics and computer programming to construct and test a wide variety of ecosystem models. A CSS model is a set of simultaneous differential equations. Nonlinear and time-dependent functions are permitted for transfers between storage components; however, the models must be predominantly continuous. Sources and sinks may be defined. Concepts necessary for program use are discussed, including preparation of program input and interpretation of program outputs. Two test cases and a listing of the program are provided. (Bell-Cornell)
W73-10736

A COMPARATIVE STUDY OF RESOURCE ANALYSIS METHODS,
Harvard Univ., Cambridge, Mass. Dept. of Landscape Architecture.
T. Murray, D. Sinton, D. Way, and C. Steinitz.
Available from the National Technical Information Service as AD-751 299. $6.00 in paper copy, $0.95 in microfiche. August 1969. 369 p, 176 fig, 3 tab, 73 ref, 11 appen.

Descriptors: *Resources, *Analysis, *Data collections, Documentation, *Computer programs, *Land use, Planning, Surveys, Evaluation, Water resources, Model studies, Systems analysis, Rivers, Watersheds (Basins), *Massachusetts.
Identifiers: *Boston (Mass.), Charles River (Mass.).

The need for resource policies which minimize the inevitable conflicts among the various demands for land calls for precise analytic and predictive methods for effective land use planning. A comparative analysis of current significant approaches to resource analysis by selected individuals and groups is presented. Despite the substantial amount of good work being done in resource analysis, a common failing in this field is a lack of documentation. Descriptions of the approaches are applied to a model for data inventory which can then be used as a basis for comparing the method descriptions. The model, relies heavily on computer use and is detailed in section II of this study. Section III describes the selected approaches, including: Their methodological goals; constraints under which the method was developed or under which it operates; data variables which are investigated; logic of the analytic approach; the applicability of the method to other areas, scales, and purposes; and its principal documentation. The method of comparison used is to abstract the logic of the approach and apply it to the common base of data bank describing the Boston Southwest Sector. Section IV is a comparative discussion of the efficacy of these methods. (Bell-Cornell).
W73-10737

6B. Evaluation Process

AN ECONOMIC MODEL OF AN AREA'S RESPONSE TO DEPLETION OF ITS WATER RESOURCES,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 04B.
W73-10405

MOBILIZATION AND PARTICIPATION OF CITIZENS GROUPS IN IMPROVING THE QUALITY OF WATER RESOURCES ENVIRONMENTS,
Minnesota Univ., Minneapolis. Dept. of Anthropology.
L. P. Gerlach.
Available from the National Technical Information Service as PB-220 964, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 57. April 1973. 16 p, 6 ref. OWRR B-031-MINN (1). 14-31-0001-3096.

Descriptors: Ecology, Environment, Environmental effects, Water resources, *Social participation, *Social values, Attitudes, Motivation, Social change, Organizations.
Identifiers: *Ecology movement, *Environmental issues, Ideology.

The ecology movement has the same general characteristics of segmentary, polycentric, reticulate organization as such other movements as the Black Power Movement and the Pentecostal Movement. The diverse groups concerned with environmental issues can be arranged on a continuum from established and routinized to new and radical. These groups proliferated rapidly from about 1969-1972. The ecology movement functions as a whole because of the way its different segments interweave in a network. There is considerable overlap between ecology groups and various 'counter-culture' segments. Recruitment to ecology groups is characteristically through face-to-face contact instead of via large scale advertising. Commitment to the ecology movement was not accomplished as dramatically as with Black Power or Pentecostalism. The opposition to the ecology movement was real and often powerful but environmentalists often perceived it to be more sinister and powerful than was the case. Common ideology concepts of the ecology movement are: doomsday theme, share guilt for environmental degradation, finite resources leading to a zero sum game, closed system and spaceship earth, need for recycling, need to control or limit growth, ecosystem and interdependence, need for significant change, and system change means lifestyle change.
W73-10409

PUBLIC PARTICIPATION IN WILLAMETTE VALLEY ENVIRONMENTAL DECISIONS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 05G.
W73-10412

LOCAL ECONOMIC IMPACT OF RESERVOIR RECREATION,
Tennessee Univ., Knoxville. Dept. of Economics.
C. B. Garrison.
Center for Business and Economic Research, Water Resources Research Center, Tennessee University, Research Report No. 27, July, 1972. 37 p, 15 tab, append. OWRR A-020-TENN (2). 14-31-0001-3543.

Descriptors: *Economic impact, *Income analysis, Water resources development, *Tennessee, *Rural areas, *Recreation, Reservoirs.
Identifiers: Multiplier effect, Primary impact, Secondary impact, *Norris Reservoir (Tenn), Local income multiplier.

Reservoir recreation affects the economy of the local area and also the larger region in which the reservoir is located. Using Norris Lake reservoir in east Tennessee as an example, the local impact of reservoir recreation activities on the surrounding rural area was studied. The impact was decomposed into (a) the primary and (b) the secondary effect. The primary effect included employment and payroll of enterprises which sell goods and services directly to recreation users. As of 1967, direct earnings of those employed in recreation-based enterprises accounted for less than two percent of the area's total personal income. The secondary impact, defined as the multiplier effects of the primary impact, were found to be small. The present study also compared the local economic impacts of utilizing a reservoir for recreation with those of establishing water-intensive manufacturing industry. The impact of water-intensive industry was found to be significantly greater than that of recreation development. (Weaver-Wisconsin)
W73-10415

METHODOLOGICAL IMPROVEMENTS IN MEASURING ECONOMIC EFFECTS OF MULTIPURPOSE WATER RESOURCE PROJECTS.
Berger (Louis), Inc., East Orange, N.J.

Available from the National Technical Information Service as PB-220 966, $4.85 in paper copy, $0.95 in microfiche. Completion Report, March 30, 1973. 79 p, 6 fig, 31 tab, 58 ref. OWRR C-3068 (3731) (1).

Descriptors: *Economic impacts, *Benefit-cost analysis, Benefit-cost ratios, Benefit-cost theory, Beneficial use, *Multiple-purpose reservoirs, Water supply, Benefits, *Multiple-purpose projects, Power, Recreation, Conservation, Municipal water, Industrial water, Agricultural economics, Flood control, Irrigation, *California.
Identifiers: Pine Flat Dam, Santa Maria Project, Trinity Project, Tulare Lake, Land enhancement, Twitchell Dam, Payment capacity.

The purpose was to analyze the methods currently used in the evaluation of the benefits and costs of multipurpose water resource projects, to recommend changes to these methods and to develop new ones which will improve these evaluations. The study was carried out by analyzing three completed multipurpose water projects: the Pine Flat Dam and Reservoir near Fresno, the Santa Maria Project near Santa Maria, and the Trinity River Division of the Central Valley Project near Redding (all in California). This group includes projects developed for providing flood protection, supplies of irrigation water, municipal and industrial water supplies, hydroelectric power, fish and wildlife habitats, and recreation. The study basically followed the structure of a benefit-cost analysis of the projects. Particular attention was paid to many environmental impacts which were improperly treated in the original plans for development. The principal recommendation to improve water project evaluation is the extension of analysis beyond the fundamental benefit-cost analysis to include many crucial impacts which are not quantifiable in monetary terms.
W73-10417

VALUES AND COST ALLOCATIONS OF SURFACE-WATER USE AND TREATMENT,
New Hampshire Univ., Durham. Agricultural Experiment Station.
R. A. Andrews, and R. R. Weyrick.
Available from the National Technical Information Service as PB-221 103, $4.85 in paper copy, $0.95 in microfiche. Publication No 500, 1972. 89 p, 7 fig, 25 tab, 9 ref. 4 append. OWRR C-1713 (No 3160) (1).

Descriptors: *Economic impact, Economics, *Linear programming, *Cost allocation, *New Hampshire, *Implied benefits, Resources, Evaluation, Water utilization, Model studies, River basin development.
Identifiers: Resource use sensitivity, *Resource allocation.

A linear programming model for a river basin was developed to include almost all water related economic activity both for consumers and producers. The model was so designed that the entire basin or basin subdivision could be analyzed. The model included seven sectors, more than nine objective function criteria, three river flow levels, two river water quality classifications and projections of population to 1980. Economic basis for conflicts among sectors over incidence of cost allocation and level of economic activity can be traced to some chosen objective. The imputed variable cost for median river flow level of 'B' class for approximately current economic activity and minimizing cost was 12 cents per pound of BOD. This cost increased to 14.6 cents when population was projected to 1980. Sensitivity analysis indicated that the optimal level of resource allocation was quite stable at each flow level. Lake shoreline was the dominant feature determining lake resource valuation. Implied capital value varied from 126 dollars per foot to over 250 dollars depending on discount rate. Imputed prices on lake surface ranged from 42 dollars to 147 dollars an acre depending on location and discount rate. Strong economic forces encouraged small lot sizes for vacation cottages.
W73-10558

AN ECONOMIC EVALUATION OF A WATER-BASED URBAN TOURIST ATTRACTION IN SAN ANTONIO, TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
W. L. Trock, and R. D. Lacewell.
Available from the National Technical Information Service as PB-221 024, $3.00 in paper copy, $0.95 in microfiche. Technical Report 48, April 1973, 131 p, 92 tab, 11 ref. OWRR B-103-TEX (1). 14-31-0001-3653.

Descriptors: *Economic impact, River basin development, *Urban sociology, *Evaluation, *Texas, Tourism, City planning, Attitudes, Social aspects, Recreation.
Identifiers: *San Antonio (Texas), *Paseo del Rio (Tex).

The purpose is to determine the economic effect of the Paseo del Rio on commercial enterprises and activities as it affects tourism and recreation in the central city. Based on the assumption that the economic effects of the developed river area arise from the expenditures of the users, and that beneficiaries are the businesses surrounding the area, three surveys have been conducted. One concerned users of the developed river area. It served to identify their socio-economic characteristics and other relevant factors which might be important to their knowledge and use of the river. The second was a survey of the businesses in the central business district to identify their economic characteristics, their relationship to the Paseo del Rio, and the proportions of gross receipts of these businesses attributable to the developed river area. A third survey served to identify characteristics of residents of San Antonio, their knowledge of the Paseo del Rio and their use of it for various purposes. (Runkles-Tex A and M)
W73-10564

A SEQUENTIAL DECISION APPROACH IN RECREATIONAL ANALYSIS,
Maryland Univ., College Park. Dept of Civil Engineering.
R. H. McCuen.
Water Resources Bulletin, Vol 9, No 2, p 219-230, April 1973. 6 tab, 4 equ, 11 ref.

Descriptors: *Recreation facilities, *Benefits, Demand, *Estimating, *Decision making, *Indiana, Water resources, Projects, Costs, Operation and maintenance, Statistical methods, Equations, Reservoirs, Risks.
Identifiers: Economic analysis, Sensitivity analysis, White River, Bloomfield (Ind), *Bayesian decision analysis, Visitation rates, Water-based recreation, *Sequential decision theory, Empirical prediction equations.

Benefits from recreation facilities can be estimated by multiplying the estimated number of user-days by an administratively determined dollar value per user-day. Such a method requires accurate estimates of total visitation to a proposed facility. The use of sequential decision theory for estimating recreation visitation rates is demonstrated. Bayesian decision analysis provides a convenient statistical framework in which estimates of recreation visitation using different methods can be combined to provide a more accurate estimate than that obtained from a single source. The Bayesian framework also provides a means of determining the optimal (with respect to a preselected cost function) number of interviews that should be conducted in the primary market area. The procedure is demonstrated for a hypothetical recreation site in southern Indiana. Actual census data for 1970 is used with empirical prediction equations to estimate visitation rates for the hypothetical site. The empirical estimates and visitation rates observed at existing facilities were used to establish a prior probability distribution for visitation to the proposed recreation facilities. The methodology of revising the initial probability distribution according to the results of user interviews is demonstrated. The effects of uncertainty involved in estimating visitation rates are assessed using sensitivity analysis. (Bell-Cornell)
W73-10619

THE DEVELOPMENT OF A PLAN OF STUDY--AN INTERAGENCY APPROACH TO MULTIOBJECTIVE PLANNING AND EVALUATION OF WATER AND LAND RESOURCE USE,
Economic Research Service, Davis. Natural Resource Economics Div.
For primary bibliographic entry see Field 06A.
W73-10622

COMPUTER SIMULATION OF RECREATIONAL BOATING ACTIVITIES,
Army Engineer District, Chicago, Ill. Economics Branch.
For primary bibliographic entry see Field 06A.
W73-10623

ESTABLISHING PRIORITIES IN MINE DRAINAGE REDUCTION, A COST-EFFECTIVENESS APPROACH,
Corps of Engineers, Baltimore, Md. Planning Div.
For primary bibliographic entry see Field 05G.
W73-10624

SOCIAL AND ECONOMIC IMPLICATIONS OF PROPOSALS FOR OUT-OF-BASIN RIVER DIVERSIONS,
Massachusetts Univ., Amherst. Water Resources Research Center.
B. B. Berger.
Journal of Professional Activities, Proceedings of the American Society of Civil Engineers, Vol 97, No PP1, p 95-110, October, 1971. 1 fig, 2 tab, 12 ref, 1 append.

Descriptors: *Environmental effects, *Social participation, *Diversion, *Inter-basin transfers, Social aspects, Flood flow, Fish, Nutrients, Estuaries, Groundwater recharge, *Connecticut River, *Massachusetts.
Identifiers: Citizens Review Committees, Quabbin Reservoir, Boston Metropolitan area.

The need for water resource planners and engineers to focus more attention on the ecologic and social aspects of their projects and proposals is discussed. The example used is the proposal to divert flood waters from the Connecticut River to the Quabbin Reservoir which is the major source of water supply for the Boston metropolitan area. Because of the drought of 1962-1966 and the increasing demands for water the reservoir is operating at about 50% of its capacity. However, the diversion proposal has met strong opposition, particularly on environmental and social issues. With the new environmental concern in this country and the passage of the National Environmental Protection Act it is not enough to simply consider engineering and economic aspects of projects. Thus, in relation to water diversions such factors as fish populations, nutrients, wastewater dilution, estuarine processes, and groundwater recharge must be studied. Also it is very important to incorporate constructive public involvement in the planning process. Citizens review committees are being effectively used in New England where a broad spectrum of water uses have been investigated. Support of proposed action programs by concerned citizens well may have a greater influence on public policy and decisions on water resources development in the future. (Elfers-North Carolina)
W73-10688

WATER QUALITY MANAGEMENT PLAN, INTERIM ST. CROIX RIVER BASIN.
Creative Research Services, Inc.
For primary bibliographic entry see Field 05G.
W73-10689

POTENTIALS FOR A DELAWARE DEEP-WATER PORT.
Gladstone Associates, Washington, D.C.
For primary bibliographic entry see Field 03E.
W73-10690

EVALUATION OF THE OHIO WATER SUPPLY PROGRAM: SUMMARY.
Environmental Protection Agency, Chicago, Ill. Div. of Air and Water Programs.
For primary bibliographic entry see Field 05G.
W73-10692

TOWN OF CAIRO WATER SUPPLY REPORT.
Diachishn (A.) and Associates.
For primary bibliographic entry see Field 03D.
W73-10693

AN ANNOTATED OUTLINE OF A WATER-RESOURCES DEVELOPMENT PLAN FOR ALABAMA,
Geological Survey of Alabama, University.
H. C. Barksdale.
Available from the National Technical Information Service as PB-213 698, $3.00 in paper copy, $0.95 in microfiche. Prepared for Alabama Development Office, Office of State Planning, Montgomery, February, 1971, Revised August 1971. Report No. ALA-GSA-X996-WRC-71-4. 23 p. WRC-71.

Descriptors: *Planning, *Water resources development, Conservation, Water supply, Environmental effects, Water demand, Institutions, *Alabama, *Management, Flood plains.

Identifiers: Flood plain management.

This short report is a general prospectus for a water resource development plan for the State of Alabama. It is felt that a water resource development plan should be an integral part of overall state planning as water is closely related to the economic and social growth and well-being of the state. The report stresses both the development and the conservation of water resources and sees conservation as a key element of a development plan. Some of the uses of water that the plan will include are domestic supply, industry, agriculture, power, fish and wildlife, waste disposal, recreation, and environmental enhancement. The prospectus also emphasizes flood-plain management and the need for more data and research in such areas as current water use, future water needs, coastal zone areas, urban hydrology, new reservoir sites, water rights, and institutional arrangements. (Elfers-North Carolina)
W73-10694

ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES.
Department of the Interior, Washington, D.C. Panel on Geothermal Energy Resources.

Report prepared for the Committee on Energy Research and Development Goals, Federal Council for Science and Technology, September 1972. 84 p, 2 tab, 2 fig, 114 refs.

Descriptors: *Geothermal studies, *Energy, *Natural resources, *Assessments, *Water supply, Mineral water, Economic impact, Steam, Hotsprings, Electrical studies, Demand, Hawaii, Alaska, Technology, Research and development, Exploration, Groundwater recharge, Power plants, Desalination, Brines, Mining, Chemicals, Monitoring, Environmental effects, Hydrogen sulfide, Drilling, Model studies, Laboratory tests.
Identifiers: Western U.S.

Members of numerous federal agencies cooperated in meeting the request of the President of the U.S. in his message on energy of June 1971. This report summarizes an assessment of geothermal energy resources. These resources are natural sources of clean energy, water and minerals that could have significant impact if fully developed. Steam and hot water could provide a substantial part of the Nation's electrical energy needs in the next few decades, especially in western states, Hawaii and Alaska. At least 19,000 MW of generating capacity could be installed by 1985 under present technology, or more than 75,000 MW by 2000 under successful research and development. Research, exploration, development skills, recharge, geothermal stimulation of dry rocks, improved power generation technology, desalination of geothermal brines, geothermal mining of chemicals, monitoring environmental effects, romoval of H2S and noise from drilling, development of a model code, better government and related liaison, and establishment of several national geothermal field research laboratories are recommended. (Popkin-Arizona)
W73-10696

AN ECONOMIC ANALYSIS OF CENTER--PIVOT SPRINKLER IRRIGATION SYSTEMS IN SOUTHEASTERN WYOMING, WITH EMPHASIS ON FINANCING ALTERNATIVES,
Wyoming Univ., Laramie. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-10700

CONCEPTUAL SYSTEM DESIGN FOR AN ENVIRONMENTAL INFORMATION BASE FOR MANAGEMENT OF WATER AND RELATED RESOURCES BY STATES,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 10A.
W73-10725

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst. Water Resources Research Center.
B. B. Berger, E. R. Kaynor, D. P. Fay, J. A. McCann, and C. Barksdale.
Available from the National Technical Information Service as PB-221 123, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Publication No 28, 1973. 160p, 7 append. OWRR C-2169 (No. 3377) (1).

Descriptors: Water supply, *Inter-basin transfer, *Alteration of flow, *Connecticut River, *Social attitudes, Social participation, Decision-making, Environment, Sediment transport, Anadromous fish, Migration, Nutrients, Water quality, Estuarine environment, *Diversion.
Identifiers: Northfield Mountain, *Boston, Quabbin Reservoir, Metropolitan District Commission, Corps of Engineers.

A study of public response to the proposal to divert flood waters from the Connecticut River at the Northfield Mountain pumped-storage hydropower plant to Quabbin Reservoir, Boston's major water supply impoundment, showed that opposition, while appearing to be broadly based, was actually limited to a relatively few knowledgeable, highly motivated individuals whose efforts delayed project approval but did not succeed in significantly influencing public officials and decision-makers. A study of potential environmental impacts based on available but generally scanty data indicated that the reduction of flood flows as proposed would (1) have little effect on sediment transport; (2) not affect significantly anadromous fish migration; (3) not affect significantly the total nutrient contribution to Long Island Sound; (4) produce no significant effect on Biochemical Oxygen Demand or on coliform organism count; (5) possibly cause changes in the estuary, none of which by itself appears significant; (6) not affect significantly the Basin's future sources of water supply. The results do not support a contention that the proposed diversion would (1) be viewed by a majority of Basin residents as significantly deleterious; (2) produce a high probability of damage to ecologic and environmental values. (See W73-10727 thru W73-10733).
W73-10726

HISTORICAL, POLITICAL AND SOCIAL FACTORS AFFECTING PUBLIC POLICY ON RIVER DIVERSION: OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO THE BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 03D.
W73-10727

ANNOTATED BIBLIOGRAPHY AND COMMENTS ON SEDIMENTATION IN THE CONNECTICUT RIVER,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 02J.
W73-10728

AN EVALUATION OF THE POSSIBLE EFFECTS OF WATER DIVERSION OF THE CONNECTICUT RIVER ON THE BIOLOGY OF ANADROMOUS FISH IN THE RIVER,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 02I.
W73-10729

THE ROLE OF FLOOD FLOWS IN NUTRIENT SUPPLY AND REMOVAL AS A FACTOR IN THE EUTROPHICATION OF THE CONNECTICUT RIVER,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 05C.
W73-10730

WHAT IS THE ROLE OF FLOOD FLOWS IN THE POLLUTION OF THE CONNECTICUT RIVER AND ITS AMELIORATION,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05B.
W73-10731

A STUDY OF THE PROBABLE EFFECTS OF THE DIVERSION OF FLOOD WATERS UPON THE ECOLOGY OF THE CONNECTICUT RIVER ESTUARY,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 02L.
W73-10732

ROLE OF CONNECTICUT RIVER FLOOD FLOWS IN RECHARGING GROUND-WATER FORMATIONS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 04B.
W73-10733

MAN-NATURE ATTITUDES OF ARIZONA WATER RESOURCE LEADERS,
Maryland Dept. of Water Resources, Annapolis.
R. A. Kanerva, and D. A. King.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 53-66, (1972). 3 tab, 4 fig, 14 ref.

Descriptors: *Attitudes, *Arizona, *Water resources, *Administration, Decision making, Environment, Cultures, Input-output analysis, Scaling, Water management (Applied), Arid lands.

A pilot study is developed to construct a scale which measures attitude towards human management in Arizona. The decision-maker's attitudes toward his man-made and natural environments are investigated in terms of cultural (interior), natural (intermediate), and balanced (exterior) reference positions. A decision-making model consists of stimuli (inputs), decision-making (process function), and response (outputs). The 12 questions developed and applied to Arizona water managers were reduced to 8 capable scalogram analysis. These scaled questions related to favoring physical or emotional needs of man, deciding who gets what or increasing the supply, including behavioral patterns, protecting environmental areas, manipulation of resources as harmful or beneficial, municipal and industrial demands, opinions of groups, and possible overuse of resources. The scale met 5 criteria, which are defined by reproducibility, non-scale pattern of response, number of questions, error ratio and cross checking of responses. This study may provide managers with means of objectively evaluating and improving decisions. (See also W73-10818) (Popkin-Arizona)
W73-10823

ROLE OF MODERN METHODS OF DATA ANALYSIS FOR INTERPRETATION OF HYDROLOGIC DATA IN ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
C. C. Kisiel, L. Duckstein, and M. M. Fogel.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 319-350, (1972). 4 tab, 36 ref.

Descriptors: *Hydrologic data, *Arizona, *Mathematical studies, *Statistical methods, *Decision

making, Water sampling, Model studies, Forecasting, Aquifers, Watersheds, Streamflow, Precipitation (Atmospheric), Control, Multiple purpose, Risks, Correlation analysis, Systems analysis, Seasonal, Probability, Ranges, Time series analysis, Regression analysis, Stream gages, Digital computers.

Mathematical models, requiring substantial data, of hydrologic and water resources systems are under intensive investigation. The processes of data analysis and model building are interrelated so that models may be used to forecast for scientific reasons or decision making. Examples are drawn from research on modeling aquifers, watersheds, streamflow and precipitation in Arizona. Classes of problems include model choice, parameter estimates, initial condition, input identification, forecasting, valuation, control, presence of multiple objectives, and uncertainty. Classes of data analysis include correlation methods, system identification, stationarity, independence or randomness, seasonality, event based approach, fitting of probability distributions, and analysis for runs, range and crossing levels. Time series, event based and regression methods are reviewed. The issues discussed are applied to tree-ring analyses, streamflow gaging stations, and digital modeling of small watersheds and the Tucson aquifers. (See also W73-10818) (Popkin-Arizona)
W73-10839

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-10879

VIRGINIA WATER POLICY: THE IMPRECISE MANDATE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W73-10890

AQUATIC PLANT CONTROL RESEARCH PROJECT PLAN FY 73-77 (PPB REPORT),
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 03B.
W73-10959

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A BUDGETING AND LINEAR PROGRAMMING ANALYSIS OF IRRIGATION WATER VALUES IN NORTHERN WYOMING,
Wyoming Univ., Laramie. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-10699

DYNAMICS OF WASTE ACCUMULATION: DISPOSAL VERSUS RECYCLING,
For primary bibliographic entry see Field 05G.
W73-10739

PRICING OF POLLUTION: THE COASE THEOREM IN THE LONG RUN,
California Univ., Los Angeles; and National Center for Health Services Research and Development, Rockville, Md.
For primary bibliographic entry see Field 05G.
W73-10740

LOWEST COST-PER-FOOT IS AIM OF OWN CALCULATIONS,
For primary bibliographic entry see Field 08G.
W73-10791

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-10879

THROUGH THE MINI MAZE,
Interdata, Inc., Oceanport, N.J.
For primary bibliographic entry see Field 07C.
W73-11015

6D. Water Demand

WATER USE, (AWWA COMMITTEE REPORT).
American Water Works Association, New York. Committee on Water Use.

Journal of the American Water Works Association, Vol 65, No 5, p 285-301, May, 1973. 2 fig, 2 tab, 1 ref.

Descriptors: Water resources development, *Water supply, *Water users, *Estimating, *Forecasting, Methodology, Evaluation, Analysis. Identifiers: Current trends, *Residential water.

Rapid urban development experienced in the past twenty years has imposed increasing demands on available water supply sources. Sound utility operations and development programs depend largely upon realistic forecasts of future requirements. Whether present indications of changes in trends are the result of temporary fluctuations or a more general, long-term leveling out of customer water requirements is a subject of increasing concern within the water industry. Results are presented studies which assess current trends in customer water use and factors studies which assess current trends in customer wate of influencing trends in order to assist in the projection of future water requirements. Water usage is generally expressed in terms of usage per customer. The study examines the nature of current water use trends or changes based on recent water-industry experience. Discussed are changes in climatological conditions, residential living patterns, established area occupancy and land use, and economic and business conditions. Part II reviews the 1966 Johns Hopkins University proposed method of estimating future residential water demand requirements for use in distribution-system analysis; its applicability as a practical method for use by utility managers and engineers in estimating future residential average and peak-flow requirements in individual communities is evaluated. (Bell-Cornell)
W73-10741

6E. Water Law and Institutions

TECHNICAL, ECONOMIC AND LEGAL ASPECTS INVOLVED IN THE EXCHANGE OF SEWAGE EFFLUENT FOR IRRIGATION WATER FOR MUNICIPAL USE, CASE STUDY - CITY OF TUCSON,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 05D.
W73-10402

MOBILIZATION AND PARTICIPATION OF CITIZENS GROUPS IN IMPROVING THE QUALITY OF WATER RESOURCES ENVIRONMENTS,
Minnesota Univ., Minneapolis. Dept. of Anthropology.
For primary bibliographic entry see Field 06B.
W73-10409

THE INTERNATIONAL HYDROLOGICAL DECADE--A PRELIMINARY EVALUATION OF A COOPERATIVE EFFORT IN THE EARTH SCIENCE FIELD,
For primary bibliographic entry see Field 02A.
W73-10424

INTERNATIONAL CO-OPERATION FOR POLLUTION CONTROL,
United Nations Inst. for Training and Research, New York.
For primary bibliographic entry see Field 05G.
W73-10566

INTERNATIONAL ENVIRONMENTAL CONTROLS IN THE SCIENTIFIC AGE,
Columbia Univ., New York. Inst. for the Study of Science in Human Affairs.
For primary bibliographic entry see Field 05G.
W73-10567

THE IMCO EXPERIENCE,
Intergovernmental Maritime Consultative Organization, London (England). Legal Div.
For primary bibliographic entry see Field 05G.
W73-10568

THE POTENTIAL OF REGIONAL ORGANIZATIONS IN MANAGING MAN'S ENVIRONMENT,
Woodrow Wilson International Center for Scholars, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-10569

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHINGTON, D.C. 2-3 JUNE 1971.
For primary bibliographic entry see Field 05G.
W73-10570

DEPARTMENT OF INTERIOR PROGRAM,
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-10571

FEDERAL INTERACTION WITH STATES,
Virginia Inst. of Marine Sciences, Gloucester Point.
For primary bibliographic entry see Field 05G.
W73-10572

LONG ISLAND'S APPROACH TO ENVIRONMENTAL QUALITY,
Ocean Systems, Inc., Reston, Va.
For primary bibliographic entry see Field 05G.
W73-10573

DELAWARE MARINE RELATED STUDY,
Hercules, Inc., Wilmington, Del.
For primary bibliographic entry see Field 05G.
W73-10574

CALIFORNIA'S MARINE PROGRAM,
Modern Management, Beverly Hills, Calif.
For primary bibliographic entry see Field 05G.
W73-10577

POLLUTION OF THE MARINE ENVIRONMENT AND THE EFFECTS THEREFROM: THE CASE FOR STRICTER ENFORCEMENT,
York Univ., Downsview (Ontario). Faculty of Environmental Studies.
For primary bibliographic entry see Field 05C.
W73-10581

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

A PREDICTIVE MODEL FOR UPPER RIO--GRANDE INDEX FLOWS,
Colorado Div. of Water Resources, Denver.
For primary bibliographic entry see Field 04A.
W73-10620

CONSTRAINTS IN WATER MANAGEMENT ON AGRICULTURAL LANDS,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 03F.
W73-10621

THE METROPOLIS RUNS DRY,
Massachusetts Univ., Boston. Dept. of Political Science.
R. A. Hogarty.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR4, p 559-570, December, 1971. 1 fig, 14 ref, 1 append.

Descriptors: *Droughts, *Water shortage, *Water allocation, *Management, Low-flow augmentation, Water demand, Water supply, Administration, Water releases, Water conservation, Planning, *Delaware River Basin Commission, Delaware River basin.

The drought that occurred in the northeastern United States from 1961 to 1967 and its effects in the Delaware River Basin are discussed. Because of the great demands for water in the Delaware River Basin (e.g. Philadelphia, New York City) the drought reached a crisis level in 1965 when New York City began to withhold water releases from its reservoirs in the headwaters of the basin. These downstream releases were required by a Supreme Court ruling and formula to preserve minimum flows in the river and maintain Philadelphia's water supply. When the formula proved to be unworkable the Delaware River Basin Commission stepped in and took on the role of arbitrator and water allocator. The Commission helped create a water bank plan, formulate flexible downstream release strategies, and ellicit cooperation from various private reservoirs to maintain minimum flows in the river. In addition, local governments initiated water conservation programs and agreements to share water supplies, the State of New Jersey took over temporary management of several reservoirs, and the federal government provided assistance. However, the key conclusion is that the Delaware River Basin Commission played a most significant role in terms of flexible management. (Elfers-North Carolina)
W73-10686

MODEL FLOOD PLAIN ZONING ORDINANCE,
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 06F.
W73-10691

WATER AND RELATED LAND RESOURCES TRAINING NEEDS STUDY, COMPREHENSIVE PLANNING FOR WATER AND RELATED LAND RESOURCES IN ALABAMA,
Auburn Univ., Ala. Center for Urban and Regional Planning.
For primary bibliographic entry see Field 09A.
W73-10695

SOME LEGAL PROBLEMS OF URBAN RUNOFF,
Arizona Univ., Tucson. Coll. of Law.
H. Holub.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 169-179, (1972). OWRR B-012-ARIZ (3).

Descriptors: *Legal aspects, *Urban runoff, *Southwest U.S., *Arid lands, *Urbanization, Beneficial use, Watershed management, Floods, Water rights, Land use, Regulation, Banks, Flood plains, Condemnation, Parks, Easements, Financing, Zoning, Coordination, Storm drains, Diversion, Recreation facilities, Flood control, Legislation.
Identifiers: Tort liability, Litigation.

Pressure is being brought to bear on national resources of air, earth, and water in the growing cities in the arid Southwest. Legal questions involved in capturing urban runoff and putting it to a beneficial use are examined. Urbanization of a watershed results in a 3 to 5 fold increase in runoff amounts. Legal aspects include tort liability from floods, water rights to the increased flows, land use restrictions along banks and flood plains, condemnation of land for park development and flowage easements, financing problems, zoning applications, and coordination of governmental bodies responsible for parks, storm drainage and related services. Urban runoff is the most obvious legal problem in the tort liability area. It appears feasible to divert small quantities of water from urban wastes for recreational uses which provide flood control benefits. It appears that municipalities could appropriate increased flows caused by urbanization. The ultimate legal questions remain to be resolved by legislation, litigation or extension of the appropriative system. (See also W73-10818) (Popkin-Arizona)
W73-10830

VIRGINIA WATER POLICY: THE IMPRECISE MANDATE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
William and Mary Law Review, Vol 14, No 2, p 312-325, Winter, 1972. OWRR B-025-VA (1).

Descriptors: *Water policy, *Water law, *Administrative agencies, Conservation, Erosion, Wetlands, Pollution, Riparian doctrine, *Virginia, *Management, *Planning, River basin development.
Identifiers: Virginia constitution, Legislative policy, Public interest, Water power, Scenic values.

An analysis of the principal sources of Virginia water policy indicates that each contains elements of a comprehensive policy statement but that no single source is adequate. The policy declaration broached in the State Constitution is in general terms only. The independent elements of state water policy enunciated by various legislative enactments are inconsistent. The legislative delegation of policy-making authority to several agencies has resulted in lack of coordination in policy and interagency conflicts. The state government traditionally has left the determination of individual water rights to the courts where the riparian doctrine has been interpreted and applied. Thus, the 'administration' of water rights and the establishment of related policy, has in large part been accomplished by the state courts rather than by the legislative or executive branches of government. The logical form for a comprehensive water policy to guide future water use appears to be a statutory enactment. The statement of water policy must recognize relationships between various aspects of water conservation and development, and it must manifest this recognition through coordination of existing policy elements.
W73-10890

PRODUCTIVITY PROBLEMS OF FRESHWATERS.
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-10895

6F. Nonstructural Alternatives

HYDROLOGICAL STUDIES OF THE UPPER PARAGUAY RIVER BASIN (PANTANAL REGION, MATO GROSSO STATE, BRAZIL),
United Nations Educational, Scientific and Cultural Organization, New York. Div. of Natural Resources Research.
For primary bibliographic entry see Field 02E.
W73-10682

MODEL FLOOD PLAIN ZONING ORDINANCE,
Mid-Ohio Regional Planning Commission, Columbus.
H. T. Merwin, T. Richardson, and R. J. Holland.
June, 1972. 34 p, 4 fig. HUD - Ohio P-289.

Descriptors: *Flood plain zoning, *Flood plains, Land use, Floodways, Planning, Legislation, *Ohio.
Identifiers: *Flood plain management, *Model ordinance, Flood hazard areas, Mid-Ohio Regional Planning Commission.

As a preface to the model ordinance, this report includes a discussion of the need for flood plain management, an explanation of some of the terms and administrative procedures involved in the ordinance, and the resolution of the Mid-Ohio Regional Planning Commission adopting the ordinance. The problems involved with urbanization of flood plains and the need for proper land use planning and flood plain management are emphasized. The MORPC intends to use the model ordinance to help communities in the planning area adopt and implement flood plain zoning. The model ordinance would establish flood plain districts, according to the determination of flood hazard areas, and define which land uses would be permitted and prohibited within the districts. The ordinance also provides for conditional uses via special permits, a board of adjustment, and appeals and hearings procedures. (Elfers-North Carolina)
W73-10691

AN ANNOTATED OUTLINE OF A WATER--RESOURCES DEVELOPMENT PLAN FOR ALABAMA,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W73-10694

FLOOD PLAIN INFORMATION--MEADOW CREEK, EAGLE RIVER, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W73-10981

6G. Ecologic Impact of Water Development

THE ECONOMIC EFFECTS OF PAWTUCKAWAY STATE PARK: V. EFFECT OF PARK USE ON ENVIRONMENTAL QUALITY,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W73-10562

INTERNATIONAL ENVIRONMENTAL CONTROLS IN THE SCIENTIFIC AGE,
Columbia Univ., New York. Inst. for the Study of Science in Human Affairs.
For primary bibliographic entry see Field 05G.
W73-10567

SOME ECOLOGICAL ASPECTS OF A NESTING COLONY OF HERONS,
Auburn Univ., Ala.
For primary bibliographic entry see Field 02H.
W73-10651

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-10726

AN EVALUATION OF THE POSSIBLE EFFECTS OF WATER DIVERSION OF THE CONNECTICUT RIVER ON THE BIOLOGY OF ANADROMOUS FISH IN THE RIVER,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 02I.
W73-10729

THE ROLE OF FLOOD FLOWS IN NUTRIENT SUPPLY AND REMOVAL AS A FACTOR IN THE EUTROPHICATION OF THE CONNECTICUT RIVER,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 05C.
W73-10730

AN INVESTIGATION OF COLORADO RIVER TRIPS: A USER STUDY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. A. Boster, and R. L. Gum.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 1-17 (1972), 3 fig, 5 tab, 2 ref.

Descriptors: *Colorado River, *Scenic highways, *Recreation demand, *Recreation facilities, *Psychological aspects, River Basin development, Public access, Public benefits, Analysis, River regulation, Decision making, Institutions, National Parks.
Identifiers: *Grand Canyon National Park and Monument, *Colorado River Outfitters Association.

Increased useer intensity of the Colorado River through Grand Canyon National Park and Monument required the National Park Service and the Colorado River Outfitters Association to adopt new policies to improve the quality of river trips and to protect the river. This study was undertaken to gain a greater awareness and understanding of visitor expectations, perceptions, interactions, satisfactions and dissatisfactions by analysis of response to a questionnaire mailed to a random sample of 2,622 past river runners from which a 65 percent return was received. Analysis of individual question tabulation and multivariate data-cluster analysis were performed. Users found crowding or user density to be at least tolerable. The largest group of runners were average in wilderness or other activities, and low relative to less strenuous activities. A large group of runners had relatively little experience in the wilderness. A large group of runners enjoyed the trip, desired more regulations, and were moderate about taking more trips. A large group rated the trip as a wilderness adventure which provided the opportunity to 'get away'. Cluster analysis is shown to be a useful tool of policy-making institutions. (See also W73-10818) (Popkin-Arizona)
W73-10819

THE SPOILS OF PROGRESS: ENVIRONMENTAL POLLUTION IN THE SOVIET UNION,
For primary bibliographic entry see Field 05G.
W73-10877

BENEFICIAL AQUATIC PLANTS IN COASTAL AREAS,
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 03B.
W73-10955

07. RESOURCES DATA

7A. Network Design

A NETWORK FOR CONTINUOUS MONITORING OF WATER QUALITY IN THE SABINE RIVER BASIN, TEXAS AND LOUISIANA,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.
W73-10683

FOCUS ON A/D AND D/A CONVERTERS,
For primary bibliographic entry see Field 07C.
W73-11018

7B. Data Acquisition

METHODS OF MEASURING MASS WASTING; REVIEW AND CRITIQUE,
Portland State Univ., Oregon.
For primary bibliographic entry see Field 02J.
W73-10422

GUIDE TO WORLD INVENTORY OF SEA, LAKE AND RIVER ICE.
For primary bibliographic entry see Field 02C.
W73-10427

DETERMINATION OF NANOGRAM LEVELS OF SILVER IN SUSPENDED MATERIALS OF STREAMS RETAINED BY A MEMBRANE FILTER WITH THE 'SAMPLING-BOAT' TECHNIQUE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-10429

A RAPID SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05A.
W73-10434

SNOW STUDIES USING THERMAL INFRARED MEASUREMENTS FROM EARTH SATELLITES,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 02C.
W73-10435

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
For primary bibliographic entry see Field 05B.
W73-10437

ANALYSIS OF WATER CONSUMPTION OF VARIOUS GRAPE CULTIVARS,
Levi Eshkol School of Agriculture, Jerusalem (Israel).
For primary bibliographic entry see Field 02D.
W73-10440

TRACER SIMULATION STUDY OF POTENTIAL SOLUTE MOVEMENT IN PORT ROYAL SOUND, SOUTH CAROLINA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-10446

SOME RESULTS AND WAYS OF DEVELOPING METHODS OF STREAMFLOW MEASUREMENT IN MOUNTAIN COUNTRIES (NEKOTORYYE ITOGI I PUTI RAZVITIYA SPOSOBOV RASCHETA STOKA V USLOVIYAKH GORNYKH STRAN),
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
V. L. Shul'ts.
In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 3-16, Leningrad, 1972.

Descriptors: *Analytical techniques, *Flow measurement, *Regions, *Mountains, Topography, Runoff.
Identifiers: USSR, Isolines.

Development of methods for measurement of mountain streamflow in the absence of data began in the USSR and abroad more than 35 years ago. The vast influence of topography on water supply and regime of mountain streams and the poor meteorological coverage of mountain regions have led to a search for relationships between many runoff characteristics and elements of the relief. For watersheds with small drainage areas (less than 100 sq km), nonclimatic factors and climatic anomalies must be considered. Assuming all conditions are observed, the method of isolines can and should be used. For mountain countries, the method of analogy may be complicated by absence of a common analog for all runoff characteristics and by remoteness of the analog from the river for which runoff characteristics are being defined. Improvements in river discharge measurement require: (1) development of empirical methods of computation of runoff characteristics; (2) study of runoff components and patterns of runoff distribution in area and time; and (3) development of theoretical methods of computation, including mathematical modeling. (See also W73-10448) (Josefson-USGS)
W73-10449

OIL/WATER INTERFACE DETECTOR,
Esso Research and Engineering Co., Florham Park, N.J.
For primary bibliographic entry see Field 05A.
W73-10466

MULTI-SENSOR DETECTION AND TRACKING OF CONTROLLED OIL SPILLS,
Spectran, Inc., Hollywood, Calif. Microwave Sensor Systems Div.
For primary bibliographic entry see Field 05B.
W73-10467

GUIDE TO SELECTING UNINTERRUPTIBLE POWER SYSTEMS.

Instruments and Control Systems, Vol. 46, No. 3, p 84-86, March 1973. 4 fig. 1 tab.

Descriptors: *Electrical equipment.
Identifiers: *Uninterruptible power systems, Power supplies.

The general characteristics of uninterruptible power systems are described. There are basically two systems: rotating power systems which employ flywheels to filter the effects of transients, maintain rotation after power failure, and start the auxiliary prime mover; and static systems which employ batteries and DC-to-AC converters. The

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advantages and disadvantages of the systems are described, and manufacturers are listed. (Little-Battelle)
W73-10472

A QUANTITATIVE PUSH-NET SYSTEM FOR TRANSECT STUDIES OF LARVAL FISH AND MACROZOOPLANKTON,
Hawaii Inst. of Marine Biology, Honolulu.
J. M. Miller.
Limnology and Oceanography, Vol 18, No 1, p 175-178, January 1973. 2 fig, 4 ref.

Descriptors: *Larvae, *Distribution patterns, *Zooplankton, *Fish, Water sampling, Equipment, Hawaii, Spatial distribution, Construction, Design, Invertebrates, Plankton nets, Surface waters.
Identifiers: *Macroinvertebrates, *Push-net sampling system, Pranesus insularum, Kaneoche Bay.

A surface plankton sampler that quantitatively samples contiguous segments of a transect has characteristics that include operability in shallow water by two investigators, paired, self-cleaning nets, a minimum of obstructions preceding the nets, and a high ratio of filtering area to mouth area. Flow through each net and the distance traveled are monitored and recorded continuously with modified TSK current meters. At a boat speed of about 3 mph (1.34 m/sec), a sample was obtained in 3 min from a 241-m segment of a 7.2-km transect in Kanehoe Bay (Oahu, Hawaii). At this operating speed, the combination of 505-micron Nitex nets and 333-micron Nitex bags yields fish larvae (2-25 mm) in good condition. Larvae of 92 species of fish (size range, 2-20 mm) have been taken with the gear from Kaneoche Bay over a one-year period. Total sampling time was less than 2 hr with this system. Using the sampling technique being described, small scale variations in the abundance of surface zooplankton can be detected. (Holoman-Battelle)
W73-10485

MODIFICATIONS OF THE BIRGE-EKMAN BOX CORER FOR USE WITH SCUBA OR DEEP SUBMERGENCE RESEARCH VESSELS,
Woods Hole Oceanographic Institution, Mass.
G. T. Rowe, and C. H. Clifford.
Limnology and Oceanography, Vol 18, No 1, p 172-175, January 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Sampling, *Equipment, *Scuba diving, Shallow water, Deep water, Construction, Design.
Identifiers: *Birge-Ekman box corer, *Research vessels, Precision.

The Birge-Ekman box corer has been modified for use by SCUBA divers or deep submergence research vessels, thus allowing control in the precision of sampling. Data suggest that the modified box corer exhibits greater accuracy and precision in estimating the abundance of species and individuals than conventional surface ship samplers or smaller corers used widely for in situ investigations. (Holoman-Battelle)
W73-10486

DEVELOPMENT OF AN OIL/WATER POLLUTION MONITOR,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W73-10491

MEASUREMENT OF CURRENT AND POTENTIAL DISTRIBUTION AT ROTATING-DISK ELECTRODES,
Bell Telephone Labs., Inc., Murray Hill, N.J.
B. Miller, and M. I. Bellavance.
Journal of the Electrochemical Society, Vol 120, No 1, p 42-53, January 1973. 15 fig, 6 tab, 26 ref.

Descriptors: *Zeta potential, *Electric currents, *Measurement, Laboratory tests, Electrical resistance, Electrical properties, Instrumentation.
Identifiers: *Rotating disk electrode, *Current distribution, Collection efficiency, Potentiometry, Sensors.

Current distribution at the rotating disk electrode has been experimentally evaluated by several techniques including single and double reference probe potential mapping, ring-disk electrode collection efficiency and resistive interaction, interrupter and steady-state resistance measurements, and automatic ohmic compensation methods. Mapping experiments are in quantitative agreement with the predictions of Newman's theory for this system and were further confirmed by resistance determinations and theoretically based correction methods. The implications of the data for various ring-disk and nonsteady-state experiments and also the utility of an approximate approach to estimating the degree of nonuniform current distribution are examined. (Holoman-Battelle)
W73-10498

OPTIMUM SAMPLE SIZES FOR THE COMPARISON OF THE CONTROL AND TREATMENT,
National Cancer Inst., Bethesda, Md. Mathematical Statistics and Applied Mathematics Section.
J-M. Nam.
Biometrics, Vol 29, No 1, p 101-108, March 1973. 3 tab, 4 ref.

Descriptors: *Statistical methods, Sampling.
Identifiers: *Sample size determination, Method validation.

The optimum sample sizes for the control and treatment groups for testing the difference between average survival times are investigated when the costs of testing the two groups differ. Situations are considered where the test cost per subject is constant and independent of its survival time as well as where it is proportional to its survival time. The optimum sample sizes are greatly preferred over equal sample sizes when the difference between the cost for the control and that for the treatment is large. (Little-Battelle)
W73-10503

TWO INSTRUMENTS FOR ACTIVATION ANALYSIS OF SOLUTIONS BY A DILUTION METHOD,
Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
P. W. F. Fouwrier, A. H. W. Aten, Jr., and J. Van Hooidonk.
International Journal of Applied Radiation and Isotopes, Vol 24, No 3, p 147-151, March 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Aqueous solutions, *Neutron activation analysis, *Laboratory equipment, Design.
Identifiers: *Sample preparation, Irradiation.

Two methods are described for the determination of the concentration of a main component in an aqueous solution by activation with a radioactive neutron source. The first method employs a rotating table with eight lucite vessels which contain the unknown and refernece samples. The neutron source is contained in a lucite plug filled with paraffin and positioned inthe center of the table. The second method employs a cylinder or sphere which contains the sample for activation. The neutron source is placed in the center for sample activation and then replaced by one or more counters for analysis. Corrections necessary for analysis by either method are given. The first technique has the advantage of using less material and of being less susceptible to disturbing influences due to impurities or differences in concentration. The second instrument is easier to obtain since it requires no special equipment except a neutron source, a counter, and glassware. (Little-Battelle)
W73-10509

MODIFICATION OF AN ISCO DRUM FRACTION COLLECTOR TO PERMIT USE OF STOPPERED TEST TUBES,
Rockefeller Univ., New York.
For primary bibliographic entry see Field 05A.
W73-10513

A NEW, SENSITIVE METHOD FOR THE DETERMINATION OF STREPTOMYCIN,
Magyar Tudomanyos Akademia, Szeged. Inst. of Biochemistry.
For primary bibliographic entry see Field 05A.
W73-10514

DIRECT MEASUREMENT OF LESS THAN 1 PART-PER-BILLION FLUORIDE IN RAIN, FOG, AND AEROSOLS WITH AN ION-SELECTIVE ELECTRODE,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-10526

A METHOD FOR COMPUTING REGRESSION COEFFICIENTS UTILIZING INCOMPLETE OBSERVATIONS,
American Univ., Washington, D.C.
C. J. Lynch.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor , Mich., 48106, Order No. 73-1350. Ph D Dissertation, 1972. 78 p.

Descriptors: *Statistical methods, *Regression analysis, Least squares method, Model studies.
Identifiers: Estimators, *Regression coefficients, *Incomplete observations, Monte Carlo method, Variance-covariance matrix, Mean square error, Variance, Bias, Data interpretation.

A method is presented for estimating coefficients of linear regressions when some observation data are missing at random. The linear model is given by Y sub t equals beta sub o plus beta sub 1 X sub t 1 plus ... plus beta sub PX sub tP plus e sub t, where the index t identifies the observation number and the e sub t are independent random disturbance terms with mean value O and (unknown) variance sigma squared. Coefficients are estimated for the conditional distribution of Y given fixed values of the X's. Observation data consist of vectors drawn from some unspecified multivariate population. Some observation vectors have components missing at random, but it is assumed that N of these vectors have at least one X value available. These N vectors are used for computing estimators of the regression coefficients. In the process of deriving these estimators, denoted by a s sub ij, missing data are approximated as regressands in least squares equations whose parameters are computed over the subset of complete observations. The s sub ij are then inserted in classical least squares formulas and estimators (consistent (C) estimators) of the parameters beta sub k, k equals O, 1, ..., P are derived. The asymptotic variance-covariance matrix of the C estimators is derived for the case of no missing dependent variables. Monte Carlo experiments were conducted to compare the C estimators to calssical least squares estimators based on the subset of complete observations and to Glasser's estimators, the only other published set of consistent estimators applicable to more than two non-random independent variables. The experiments were conducted for N equals 25 with P equals 3 and for N equals 40 with P equals 5. The sample mean-square-error and, separately, the absolute value of the sample bias were used as test criteria. The Monte Carlo experiments suggest that the C estimators retain their relative superiority over Glasser's estimators with respect to both mean-square-error and bias and over classical least squares with respect to mean-square-error for N equals 25 with P equals 3 and for N equals 40 with P equals 5. The

Monte Carlo experiments also suggest that the C estimators retain their relative superiority over classical least squares with respect to bias for N equals 40 with P equals 5, but the reverse is true for N equals 25 with P equals 3. (Holoman-Battelle)
W73-10533

LARGER DIAMETER COLUMNS FOR MODERN, HIGH SPEED LIQUID CHROMATOGRAPHY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 02K.
W73-10539

METHOD FOR HIGH-SPEED LIQUID CHROMATOGRAPHIC ANALYSIS OF BENOMYL AND/OR METABOLITE RESIDUES IN COW MILK, URINE, FECES, AND TISSUES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept.
For primary bibliographic entry see Field 05A.
W73-10547

A STUDY TO IMPROVE DISSOLVED OXYGEN ANALYSIS TECHNIQUES TO FACILITATE WATER QUALITY FIELD SURVEY APPLICATIONS,
Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
For primary bibliographic entry see Field 05A.
W73-10559

A PROTOTYPE TOTALISING CURRENT-METER (MARK II); A SELF-MOORED VERSION FOR NEAR-SURFACE USE ESPECIALLY IN FOUL WATER ESTUARIES IN CONNECTION WITH POLLUTANT DISPERSAL STUDIES,
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 05B.
W73-10580

SIDE-LOOK RADAR PROVIDES A NEW TOOL FOR TOPOGRAPHIC AND GEOLOGICAL SURVEYS,
Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
R. E. Powers.
Westinghouse Eng., Vol 32, No 6, p 176-181, Nov 1972. 2 photo, 3 dwg.

Descriptors: *Geological surveys, *Geologic investigations, *Aerial photography, Mapping, Geologic mapping, Aerial surveys, Photogeology, Remote sensing, Surveying, Surveys, Terrain analysis, *Topographic mapping, Radar, Faults (Geologic).
Identifiers: *Radar images, Nicaragua, Resolution, Distortion (Optics), Vegetal cover.

Side-look radar (SLR) imagery is now being used for aerial mapping of large areas of the world. Geologists are beginning to recognize the SLR capability to display landforms and surface expressions of subsurface geological structures. In equatorial regions that are almost constantly covered with clouds, SLR penetrates the clouds, allowing mapping that would be difficult using aerial photography. In Ecuador, a drainage map produced by SLR imagery was superior to infrared photography methods often used. In the Southwestern US, SLR imagery located important geologic faults not visible from aerial photographs. In Nicaragua, obtaining SLR imagery for the entire country took 7 days, and 4 months later, comprehensive maps were prepared showing geology, geomorphology, surface drainage, generalized land use, and vegetation. SLR imagery is accomplished from an airplane by recording a television like picture one line at a time. The traversing cathoderay-tube trace varies in intensity as the returning signal amplitude varies. Resolution and distortion of SLR imagery are discussed. Possible future uses include updating maps and identifying surface materials. (USBR)
W73-10615

INITIAL WETTING LOSSES INCURRED BY GROUND LEVEL STEREO GAGES,
Eidgenoessische Technische Hochschule, Zurich, (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 02G.
W73-10659

GEOHYDROLOGIC STUDY OF THE GORT LOWLAND AND ADJACENT AREAS OF WESTERN IRELAND USING ENVIRONMENTAL ISOTOPES,
Ceylon Univ., Peradeniya.
For primary bibliographic entry see Field 02F.
W73-10660

MASS BALANCE AND SPECTRAL ANALYSIS APPLIED TO KARST HYDROLOGIC NETWORKS,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 02F.
W73-10661

AN ON-SITE HYDROLOGIC DATA RECORDING SYSTEM,
Utah Water Research Lab, Logan.
D. G. Chadwick.
Water Resources Bulletin, Vol 9, No 2, p 328-337, April 1973. 9 fig, 1 ref.

Descriptors: *Data collections, *Hydrologic data, *Telemetery, *Instrumentation, Precipitation (Atmospheric), Rainfall, Rain gages, Anemometers, Water levels, Stream gages.

A system for collecting hydrologic data has the capability to operate unattended for long periods of time, reliably sensing and digitizing data at predetermined intervals for data transmission or storage. Little power is needed for system operation in the standby mode. Batteries supply the energy required for operation, so it can be used in remote places. Data are taken from a precipitation gage, temperature probe, wind direction indicator, wind sensor, and water-level sensor. The system is periodically actuated by a solid-state clock. The record is made on an 8-channel paper-tape punch. (Knapp-USGS)
W73-10677

PRECISE WATER VELOCITY MEASUREMENTS USING PHOTOGRAMMETRIC TECHNIQUES,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05B.
W73-10678

TEST RESULTS OF SIX-MONTH TEST OF TWO WATER ELECTROLYSIS SYSTEMS,
McDonnell Douglas Astronautics Com., Huntington Beach, Calif. Biotechnology and Power Dept.
For primary bibliographic entry see Field 02K.
W73-10685

STUDY OF THE STATE OF WATER AND WATER EXCHANGE OF A PLANT CELL BY IR ABSORPTION SPECTRA, (IN RUSSIAN),
Kazan State Univ., (USSR).
N. V. Sedykh, and E. A. Stupishina.
Fiziol Biokhim Kul't rast. Vol 4, No 3, p 295-299, 1972. Illus. English summary.
Identifiers: Absorption spectra (Plants), *Plant tissues, Spectra, *Plant cells, *Infrared radiation.

IR-spectra of some plant tissues and cellular structures were used to calculate the strength of hydrogen bonds and ratio of ice-like and dense-packed structures in tissue water. A higher structurization of water was found in mesophyll, growing cell and organelles. --Copyright 1973, Biological Abstracts, Inc.
W73-10702

LEAF DIFFUSION RESISTANCE TO WATER VAPOUR AND ITS DIRECT MEASUREMENT: I. INTRODUCTION AND REVIEW CONCERNING RELEVANT FACTORS AND METHODS,
Agricultural Univ., Wageningen (Netherlands). Lab. of Physiological Meteorology.
C. J. Stigter.
Meded Landbouwhogesch Wageningen. Vol 72, No 3, p 5-47, 1972. Illus.
Identifiers: Diffusion, *Leaf diffusion, Measurement, Review, *Wallihan meter, *Water vapor.

Relevant factors and methods were discussed and a literature review was given regarding direct measurement of leaf diffusion resistance to water vapor, with emphasis on field measurements. Leaf resistance, canopy climate, and behavior of stomata were discussed. Components of diffusion resistance and the factors which influence its value were listed. An apparatus for vertical profile measurements within a canopy, the Wallihan leaf diffusion resistance meter, was discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-10703

60 GHZ RADIOMETRIC LOCAL VERTICAL SENSOR EXPERIMENT,
Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
C. H. Grauling, Jr.
National Aeronautics and Space Administration Contractor Report NASA CR-2229, April 1973. 198 p, 102 fig, 11 tab, 47 ref, append. NASI-10131.

Descriptors: *Radiation, *Electromagnetic waves, *Remote sensing, *Satellites (Artificial), *Radio waves, Research and development, Atmosphere, Oxygen, Light intensity, Temperature, Model studies, Computer programs, Systems analysis, Instrumentation.
Identifiers: *Radiometric vertical sensor, Radiance profile.

Major results are summarized for spacecraft development of the Radiometric Local/Vertical Sensor Experiment. The experiment involves the use of millimeter wave radiation from the atmospheric oxygen to provide vertical sensing information to a satellite-borne radiometer. The radiance profile studies require the calculation of ray brightness temperature as a function of tangential altitude and atmosphere model, and the computer program developed for this purpose is discussed. Detailed calculations were made for a total of 12 atmosphere models, including some showing severe warming conditions. The experiment system analysis investigates the effect of various design choices on system behavior. Calculated temperature profiles are presented for a wide variety of frequencies, bandwidths, and atmosphere models. System performance is determined by the convolution of the brightness temperature and an assumed antenna pattern. A compensation scheme to account for different 'plateau' temperatures is developed and demonstrated. Curves of predicted system behavior are presented for many different atmosphere combinations, antenna pattern shapes, and antenna beamwidths. The millimeter wave components developed for the local vertical sensor are discussed, with emphasis on the antenna, low noise mixer, and solid-state local oscillator. A viable sensing technique exists, useful over a wide range of altitude with an accuracy generally in the order of 0.01 degree or better. (Woodard-USGS)
W73-10743

WOODY PHREATOPHYTES ALONG THE BRAZOS RIVER AND SELECTED TRIBUTARIES ABOVE POSSUM KINGDOM LAKE,
Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 03B.
W73-10745

WAVE ESTIMATES FOR COASTAL REGIONS,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 02J.
W73-10751

CURRENTS AND SEDIMENT TRANSPORT AT THE WILMINGTON CANYON SHELFBREAK, AS OBSERVED BY UNDERWATER TELEVISION,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
For primary bibliographic entry see Field 02J.
W73-10772

FILTERS WITH A CONSTANT MOISTURE POTENTIAL AT THE SURFACE (FIL'TRY S POSTOYANNYM POTENTSIALOM VLAGI NA POVERKHNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Torfyanoi Promyshlennosti, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-10774

AT-STREAM-VELOCITY PUMPING SEDIMENT SAMPLING SYSTEM,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W73-10992

DETECTORS FOR MEASUREMENT OF WATER POLLUTION.
For primary bibliographic entry see Field 05A.
W73-11016

7C. Evaluation, Processing and Publication

SYNTHESIS AND EVALUATION OF URBAN-REGIONAL HYDROLOGIC RAINFALL-RUNOFF CRITERIA,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 02A.
W73-10416

A FINITE ELEMENT SOLUTION FOR TWO--DIMENSIONAL DENSITY STRATIFIED FLOW,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 02H.
W73-10418

THE APPLICATION OF MULTI-ATTRIBUTE SCALING PROCEDURES TO THE DEVELOPMENT OF INDICES OF VALUE,
Michigan Univ., Ann Arbor. Engineering Psychology Lab.
For primary bibliographic entry see Field 05A.
W73-10464

MEASUREMENT OF CURRENT AND POTENTIAL DISTRIBUTION AT ROTATING-DISK ELECTRODES,
Bell Telephone Labs., Inc., Murray Hill, N.J.
For primary bibliographic entry see Field 07B.
W73-10498

(CALIFORNIA COMPREHENSIVE OCEAN AREA PLAN). APPENDIX I: PERMANENT COASTAL ZONE DATA INVENTORY AND INFORMATION SYSTEM,
California State Dept. of Navigation and Ocean Development, Sacramento.
R. A. Nash.
Nov 30, 1970. 137 p, 10 fig, 7 tab, 19 ref. HUD supported.

Descriptors: *California, *Coasts, *Data collections, *Data processing, *Information exchange, Planning, Management, Systems analysis.

A permanent data inventory and information system is necessary to the support of essential decisions for planning and managing the California coastal zone. Recommendations for establishment and operation of an automated system are given. The required data are available from local, state, and federal agencies. The inventory and information system could be made available within two years after funding approval. (Ensign-PAI)
W73-10552

STOCHASTIC MODELS APPLIED TO OPERATION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 02A.
W73-10565

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHINGTON, D.C. 2-3 JUNE 1971.
For primary bibliographic entry see Field 05G.
W73-10570

SIDE-LOOK RADAR PROVIDES A NEW TOOL FOR TOPOGRAPHIC AND GEOLOGICAL SURVEYS,
Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
For primary bibliographic entry see Field 07B.
W73-10615

DATA ON SELECTED LAKES IN WASHINGTON, PART I,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 02H.
W73-10654

THE APPLICATION OF A SIMPLE RAINFALL--RUNOFF MODEL TO A CATCHMENT WITH INCOMPLETE DATA COVERAGE,
Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 02A.
W73-10656

MATHEMATICAL SIMULATION OF THE SUBSIDENCE OF VENICE: 1. THEORY,
Centro di Ricera IBM di Venezia (Italy).
For primary bibliographic entry see Field 02F.
W73-10663

THE WATER RESOURCES PROGRAMS OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W73-10674

AN ON-SITE HYDROLOGIC DATA RECORDING SYSTEM,
Utah Water Research Lab, Logan.
For primary bibliographic entry see Field 07B.
W73-10677

W.A.L.R.U.S. I WATER AND LAND RESOURCE UTILIZATION SIMULATION,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 06A.
W73-10735

CSS: A COMPUTER PROGRAM FOR MODELING ECOLOGICAL SYSTEMS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 06A.
W73-10736

A COMPARATIVE STUDY OF RESOURCE ANALYSIS METHODS,
Harvard Univ., Cambridge, Mass. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 06A.
W73-10737

60 GHZ RADIOMETRIC LOCAL VERTICAL SENSOR EXPERIMENT,
Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
For primary bibliographic entry see Field 07B.
W73-10743

DISTRIBUTION OF MORE IMPORTANT COMPLEX BIOMETEOROLOGICAL INDICES OVER THE GLOBE,
For primary bibliographic entry see Field 02B.
W73-10816

OPTIMAL FEEDBACK CONTROL - A SYNOPSIS,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
N. C. Pereira, L. T. Fan, and C. L. Hwang.
Report 29, Kansas Water Resources Research Institute Contribution No. 66, 1971. 40 p, 29 ref. OWRR A-038-KAN (2). 14-31-0001-3216.

Descriptors: *Dynamic programming, *Control systems, Model studies, *Optimization, Mathematical models, Mathematical studies.
Identifiers: *Optimal feedback control theory, Linear systems, Nonlinear systems.

The development of optimal feedback control theory through continuous dynamic programming and the continuous maximum principle is presented. The development initially deals with linear systems and is then extended to nonlinear systems and distributed parameter systems. The applications of theoretical results are illustrated by means of selected simple examples from the literature.
W73-10887

THE MODELLING OF THE ECOSYSTEM OF LAKE DALNEE ON AN ELECTRONIC COMPUTER,
For primary bibliographic entry see Field 05C.
W73-10899

HYDROLOGIC MODELING, PARAMETER ESTIMATION, AND WATERSHED CHARACTERISTICS,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 02A.
W73-10964

INFORMATION CONTENT OF TIME-VARIANT DATA,
Nevada Univ., Reno. Dept. of Civil Engineering.
V. L. Gupta.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9615, p 383-394, March 1973. 4 fig, 1 tab, 14 ref, append. OWRR A-049-NEV (1).

Descriptors: *Data collections, *Hydrologic data, *Statistical methods, Sampling, Data processing, Data storage and retrieval, Model studies, Stream gages, Gaging stations, Variability, Correlation analysis, *California.
Identifiers: Eel River Basin (Calif).

A method is presented for the delineation of optimal sampling frequencies in discrete data aquisition programs in the fields of hydrology and water resources. Statistical treatment and the implications of information content are discussed in terms of the variability of sample mean and sample variance. The method is illustrated with three streamflow gaging stations in the Eel River basin, California. The variation of information content with sampling interval yields guidelines for the choice of a sampling frequency such that persistence effects and the consequent redundancy of information are minimized. (Knapp-USGS)
W73-10969

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1972.
Geological Survey, Washington, D.C.

Report of Investigations Folder, 1973. 1 sheet, 7 fig, 1 map.

Descriptors: Water resources, Investigations, *Inter-agency cooperation, *North Dakota, *Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Groundwater, Water quality, On-site investigations, Dissolved solids, Water level fluctuations, Bibliographies, Networks, *Maps, Streamflow.
Identifiers: *Cooperative water-studies program, Research projects.

Water-resources studies and investigations in North Dakota made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretive studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show principal sources of groundwater, average annual precipitation, discharge of the principal rivers, and the dissolved solids in surface waters. A map, scale 50 miles to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in progress as of November 1972. (Woodard-USGS)
W73-10980

IRRIGABILITY CLASSIFICATION OF SOILS, (IRRIGABLE SOILS OF NEVADA).
For primary bibliographic entry see Field 03F.
W73-10983

RECONNAISSANCE OF THE MANISTEE RIVER, A COLD-WATER RIVER IN THE NORTHWESTERN PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Washington, D.C.
G. E. Hendrickson, and C. J. Doonan.
Geological Survey Hydrologic Investigations Atlas HA-436, 1972. 2 sheets, 15 fig, 5 ref.

Descriptors: *Hydrologic data, *Streamflow, *Water quality, *Michigan, Water properties, Data collections, Recreation facilities, Cold-water fishing, Trout, Stream gages, Flow measurement, Water yield, Water analysis, Chemical analysis, *Maps, Curves, Geology, Groundwater movement, Base flow.
Identifiers: *Manistee River (Mich).

The Manistee River is one of Michigan's well-known trout streams because of its numerous public access sites and campgrounds. The recreational values of the Manistee depend on its characteristics of streamflow, water quality, and bed and banks. This atlas describes these characteristics and shows how they relate to recreational use. The Manistee River basin above Smithville drains an area of about 500 square miles. More than half of this area is outwash plains underlain by permeable soils and glacial drift. The rest of the basin is chiefly rolling to hilly, topography characteristic of glacial moraines. The large component of groundwater flow makes the Manistee a stable stream with relatively small fluctuations in discharge and stage. The average monthly discharge in cfsm at the Grayling gage ranges from 1.37 in April to 1.07 in August. This is the smallest variation in monthly discharge recorded for any stream in Michigan's southern peninsula. The water is of the calcium-bicarbonate type, moderately hard, and low in sulfates and chlorides. (Woodard-USGS)
W73-10985

WATER-TEMPERATURE DATA ACQUISITION ACTIVITIES IN THE UNITED STATES,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
F. H. Pauszek.
Available from NTIS, Springfield, Va 22151. PB-213 972. Price $3.00 printed copy; $0.95 microfiche. Geological Survey Water-Resources Investigations 2-72, 1972. 47 p, 16 fig, 8 tab, 92 ref.

Descriptors: *Water temperatures, *Surface waters, *Groundwater, *United States, Sites, Federal government, Data collections, Measurement, Streams, Rivers, Lakes, Reservoirs, Estuaries, Water wells, Springs, Reviews, Information retrieval.
Identifiers: *Water-temperature measuring sites (US).

Information on water-temperature measuring sites in the United States is presented by means of tables and illustrations preceded by brief explanations. Included are the agencies collecting the data, the number of stations located on surface waters and groundwaters where temperature measurements are made, the distribution of stations by states and by the 21 regions of the Water Resources Council (WRC), a federal agency created in accordance with the Water Resources Planning Act of 1965, and the frequency of measurements. The report does not contain the actual temperature data. A bibliography lists 194 references which contain temperature data. (Woodard-USGS)
W73-10986

A TEST OF EQUALITY OF MEANS OF CORRELATED VARIATES WITH MISSING DATA ON ONE RESPONSE,
Pennsylvania Univ., Philadelphia.
D. F. Morrison.
Biometrika, Vol 60, No 1, p 101-105, April 1973. 1 tab, 5 ref.

Descriptors: *Statistical methods.
Identifiers: *Hypothesis testing, *Missing data, Testing, Paired t statistics, Mean values.

A statistic is proposed for testing the hypothesis of equality of the means of a bivariate normal distribution with unknown common variance and correlation coefficient when observations are missing at random on one of the variates. Expressions for the second and fourth moments of the statistic have been obtained, and normal, t and Cornish-Fisher approximations to the percentage points under the null hypothesis have been found from them. The expected squared lengths of the confidence intervals for the mean difference have been used to measure the additional sensitivity of the test over that of the conventional paired t. (Little-Battelle)
W73-11013

A TWO-SAMPLE PROCEDURE FOR SELECTING THE POPULATION WITH THE LARGEST MEAN FROM SEVERAL NORMAL POPULATIONS WITH UNKNOWN VARIANCES,
Bath Univ. of Technology (England).
J. B. Ofosu.
Biometrika, Vol 60, No 1, p 117-124, April 1973. 5 tab, 7 ref.

Descriptors: Statistical methods.
Identifiers: *Two-sample procedure, *Mean values, Best normal population.

A two-sample procedure is described for selecting the population with the largest mean from k normal populations with unknown variances. The method is based on a two-sample procedure proposed by Stein (1945). Tables necessary for the application of the procedure are given for selected values of k. Comparisons of the minimum values of the expected sample sizes using the proposed procedure are made with the corresponding single-sample sizes for known variances (Bechhofer, 1954). Comparisons are also made of the expected total sample sizes for the single-sample procedure, the two-sample procedure given and the two-sample procedure proposed by Bechhofer, Dunnett and Sobel (1954) which assumes that the populations have known variance ratios. The expected total sample sizes are not much increased by ignorance of the variance ratios. (Little-Battelle)
W73-11014

THROUGH THE MINI MAZE,
Interdata, Inc., Oceanport, N.J.
J. Folts.
Automation, Vol 20, No 2, p 44-48, February 1973. 3 fig.

Descriptors: *Data collections, *Real costs, *Monitoring, *Data processing, Equipment, Water pollution, Automatic control, Design criteria, Industrial production, Methodology, Cost analysis, Automation, Instrumentation, Specifications.
Identifiers: *Minicomputers, Performance evaluation.

A discussion is presented which represents an effort to give those researchers interested in using minicomputers some idea of the real costs of mini systems and the hidden pitfalls of minicomputer application. The applications considered are those in which (1) no changes are made in the mini system without first taking it off-line; (2) multifunctional tasks are considered and the application programs are altered or replaced while the system is still on-line; and (3) multifunctional tasks involve incorporating on-line interaction with terminals and the ability to change application programs while simultaneously performing background computations. Extensive record-keeping and summary report generation is also involved. Three classes of machines that will provide the 'computer horsepower' to perform the above tasks are described and assessed on the basis of costs and performance. In addition, the pitfalls of system design are discussed. (Holoman-Battelle)
W73-11015

AN ESTIMATOR FOR THE SIZE OF AN ANIMAL POPULATION,
Birkbeck Coll., London (England).
P. Holgate.
Biometrika, Vol 60, No 1, p 135-140, April 1973. 7 ref.

Descriptors: *Statistical methods, *Animal populations, *Estimating, Age, Mortality.
Identifiers: *Data interpretation, Bias, Variance.

A method of estimating animal populations which is popular among zoologists is to take the total of the ages of animals that die during a given year as an estimator of population size. In this note the bias and variance of the estimator are investigated

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for a stationary model, and for one based on a branching process. A numerical illustration is given. (Little-Battelle)
W73-11017

FOCUS ON A/D AND D/A CONVERTERS,
D. N. Kaye.
Electronic Design, Vol 21, No 1, p 56-65, January 4, 1973. 4 fig.

Descriptors: *Automatic control, *Specifications, *Design data, *Data collections, Electrical equipment, Instrumentation, Design criteria, Automation, Electrical converters, Performance.
Identifiers: *Analog-to-digital converters, *Digital-to-analog converters, Accuracy, Weighted-resistor d/a converters, R-2R d/a converters, Dual-slope integration a/d converters, Successive approximation a/d converters.

Analog-to-digital and digital-to-analog converters are discussed in reference to their circuitry, modes of operation, and other specifications. The vast majority of d/a converters on the market today use two basic circuits: the weight-resistor network and the R-2R configuration. These two types are most conveniently described for the case of a voltage-output d/a--that is, the case where a digital input yields a discrete voltage level at the output. As with d/a converters, the vast majority of a/d converters on the market comprise two basic types: the dual-slope integration a/d converter and the successive approximation a/d converter. Each takes a voltage input and puts out a digital code proportional to the input voltage. A/d specifications are similar to d/a specifications, a main difference being the output of a series of digital codes by an a/d converter. Manufacturers of converters of various specifications and costs are listed. (Holoman-Battelle)
W73-11018

DIGITAL-TO-ANALOG CONVERTER HAVING COMMON-MODE ISOLATION AND DIFFERENTIAL OUTPUT,
IBM General Systems Div. Lab., Boca Raton, Fla.
G. A. Hellwarth, and S. Boinodiris.
IBM Journal of Research and Development, Vol 17, No 1, p 54-60, January 1973. 7 fig, 1 tab, 8 ref.

Descriptors: *Automatic control, *Data collections, *Data processing, Instrumentation, Data storage and retrival, Electrical properties, Electrical equipment, Computers, Automation, Electric converters, Electrical networks, Electrical impedance, Direct currents.
Identifiers: *Digital-to-analog converters, *Common-mode isolation, *Differential output, Performance evaluation, Accuracy, Noise (Electronics), Noise (Environmental).

A digital-to-analog converter (DAC) is described that has transformer-coupled isolation for both power and data inputs and provides a true differential output. The DAC provides a 10-bit, 10.23-V unipolar output of either polarity, depending on which of the two output lines is used as the load reference potential. The common mode potential may be as large as 250 V, and below 120 Hz the common-mode rejection typically exceeds 100 dB. The isolated, balanced circuit eliminates environmental noise problems and permits long cabling lengths without loss of dc accuracy. The DAC is an analog output feature available on the IBM System/7, a small computer designed for data acquisition and real-time automation applications. (Holoman-Battelle)
W73-11019

08. ENGINEERING WORKS

8A. Structures

THE SAN FERNANDO EARTHQUAKE: A LESSON IN HIGHWAY AND BRIDGE DESIGN,
California State Div. of Highways, Sacramento.
A. L. Elliott.
Civ Eng, Vol 42, No 9, p 95-97, Sept 1972. 1 fig, 6 photo.

Descriptors: *Bridge design, *Bridge failure, Joints (Connections), Earthquakes, Bridges, Earthquake engineering, Seismic design, Structural design, Seismology, Seismographs, Columns, Reinforced concrete, *California.
Identifiers: *San Fernando earthquake, *Highway bridges, Earthquake damage, *Earthquake-resistant structures.

In the San Fernando Valley of California, on February 9, 1971, an earthquake destroyed many earthquake-resistant structures in just 12 seconds. With many recording instruments in the area, engineers were able to learn the structural reactions to earthquake forces. Most obvious was that structures located in the disruptive center are inevitably subject to severe structural damage. Designing to prevent all damage is neither feasible nor economical, but sound designs should be used to prevent total collapse of the structure. Remedies for 6 structural weaknesses are discussed. Recommended design modifications are: (1) concrete columns with heavier and closer spaced continuous spiral reinforcing; (2) expansion joints with restraints for large movements; (3) no lap splices in main column bays for columns less than 30 ft high; (4) better anchorage of piles in footings; (5) better keying and lateral restraint at abutments; and (6) dynamic analysis that considers earthquake motion, structural response, and foundation materials. (USBR)
W73-10612

RAW WATER TRANSMISSION SYSTEM FOR SPRINGFIELD, MASS.,
Hazen and Sawyer, New York.
W. B. Sinnott, and S. S. W. Yuan.
Transportation Engineering Journal, Proceedings of the American Society of Civil Engineers, Vol 97, No TE3, p 459-467, August, 1971. 9 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Water supply, *Water conveyance, Project planning, *Hydraulic design, Computer models, Simulation analysis, *Massachusetts, *Reservoirs.
Identifiers: *Springfield (Mass), Waterhammer, Cobble Mountain Reservoir, Littlefield Reservoir.

Because of the drought in the northeastern United States during 1961-1966, many cities began looking for additional sources of water supply. The City of Springfield decided to use water available in a new reservoir constructed by the Army Corps of Engineers (for flood control purposes) and to divert this water, about 60 mgd, to the city's Cobble Mountain Reservoir. The article focuses on the design of the water conveyance system between the two reservoirs. A particular problem involved in the operation of the system was waterhammer transients (pressure in the pipes) due to the length of the lines and the great amount of pumping involved. Computer simulations and field tests aided in determining an optimal system of values to control the waterhammer transients. (Elfers-North Carolina)
W73-10687

NEW ACOUSTIC TOOL LOGS CASED HOLES,
Pan Geo Atlas Corp., Houston, Tex.
D. M. Muir, and W. A. Zoeller.
Oil and Gas Journal, Vol 65, No 43, p 106-112, October 23, 1967. 10 fig.

Descriptors: Boreholes, Well casing, *Logging (Recording), Cement grouting, Grouting, *Nuclear moisture meters, *Acoustics, Wells, Texas, Velocity.
Identifiers: Formation evaluation, Formation-travel (Sound) times.

An improved acoustic tool is described which makes it possible to obtain porosity and lithology data from cased wells, while at the same time making it possible to evaluate the cement condition from the data recorded. In most situations, no more than 40 to 50% cement bond is required for accurate recording of formation - travel times. Under certain fast-velocity-formation conditions, accurate time logs have been obtained with an even smaller percentage of bonding. The equipment permits simultaneous recording of the acoustic, gamma ray, neutron, caliper, and collar logs. The acoustic tool is primarily a transmitting transducer positioned above two or more receiving transducers. The formation signal consisting of time and amplitude, is recorded in travel time by use of a complex measuring. The epithermal-neutron tool's response is a measure of hydrogen present within the investigated section. Neutron charts are available for determining porosity using different annulus vs. casing sizes. Logs for the three main conditions which may exist in a borehole after cementing are shown. (Campbell-NWWA)
W73-10705

SURFACE-HOLE TECHNIQUES SHOULD BE SIMPLE AND CHEAP,
Oklahoma Univ., Norman.
P. L. Moore.
Oil and Gas Journal, Vol 66, No 47, p 173, 176, 179, November 18, 1968. 2 fig.

Descriptors: Drilling, *Rotary drilling, Drilling fluids, Drilling equipment, Bentonite, Florculation, Costs, *Economic justification, *Exploration, Oil industry, Offshore platforms.
Identifiers: Drilling rates.

The reduction of drilling costs has become a major issue in the oil and gas exploration industry. This has been caused by the finding of new reserves in difficult-to-drill areas, such as permafrost, rough sea, and very deep localities. Generally, the best drilling practices are those where simplicity is emphasized. Several rules-of-thumb having general application to surface hole techniques are: (1) If more lift is needed, flocculate the mud; (2) Do not use chemical thinners, because they reduce lift capacity; (3) Don't worry about water-loss control; (4) Keep mud weights low--at least below 9.5 lb/gal and preferably 9.0 lb/gal or below; (5) Don't use high-priced thickening agents. Hole enlargement in the surface hole is a common problem, as are torque and formation-heaving problems. The remedy is to increase lifting capacity of the drilling fluid by increasing the viscous properties of the mud, or to slow down drilling. (Smith-NWWA)
W73-10706

HOW CONDITIONS AFFECT REACTION RATE OF WELL-TREATING ACIDS,
Marathon Oil Co., Denver, Colo.
H. K. Van Poolen, and J. R. Jargon.
Oil and Gas Journal, Vol 66, No 43, p 84-91, Oct 21, 1968. 15 fig, 1 tab, 24 ref.

Descriptors: *Acids, Acidity, Limestones, Dolomite, Calcium carbonate, *Carbonates, Calcium chloride, Temperature, *Chemical reactions, Pressure, Carbon dioxide, Hydrogen ion concentration.
Identifiers: *Acidizing, Weak acids, Hydrochloric acid, Buffers, Common ion effect, *Reaction rate.

The velocity of the chemical reaction which occurs during an acid treatment determines, to a great extent, the rate at which the acid should be pumped into the formation. Factors which influence the reaction rate–type of acid, formation composition and structure, pressure, temperature, acid concentration, acid velocity, and the formation of secondary products–are studied. The discussion is limited to limestone and dolomite, although some carbonate-cemented sandstone also responds to acid treatment. The reaction rate of calcium carbonate and HCl is reduced by the common ion effect as explained in an accompanying table. 'Weak acids', such as acetic, formic, benzoic, and lactic acids, are sometimes used in order to slow reaction rate. The partial neutralization of a weak acid forms a buffer solution which prevents a too-rapid rise in pH from occurring. Equalization of the reaction rates between HCl and limestone and HCl and dolomite is discussed. (Campbell-NWWA)
W73-10707

WELL LEVEL MEASUREMENT METHODS,
Maguire (Charles A.) and Associates, Boston, Mass.
For primary bibliographic entry see Field 08G.
W73-10710

NOTES ON DEVELOPING GROUND WATERS,
International Water Supply Association, Montreal (Quebec).
For primary bibliographic entry see Field 04B.
W73-10711

WELL OPERATION,
Madison Water Utility, Wis.
L. M. Nelson.
Journal of the American Water Works Association, Vol 62, No 7, p 436-438, July 1970.

Descriptors: Wells, *Water wells, Municipal water, Groundwater, *Well data, Pumps, *Water supply, Water sampling, Chlorination, Disinfection, Specific capacity, Drawdown, *Maintenance, Hardness (Water), Chemical analysis.
Identifiers: Submersible pumps, Turbine pumps, *Records.

In the operation of wells, a number of factors are involved to maintain a pure and adequate water supply. A durable water-tight casing should line the well to a depth of the first impervious rock formation. The well water should be continually checked by means of water sampling to insure freedom from bacterial contamination. If samples show no signs of bacterial contamination the water is safe for public use; if the samples indicate pollution, disinfection with chlorine should be used and, if repeated, a search made for the source of contamination. Selection and maintenance of well pumping equipment is another factor. Submersibles and deep-well turbine pumps are the two types generally used in deepwell application. Before a pump can intelligently be selected for any installation, it is necessary that accurate information by available with regard to required capacity, operating conditions and total head. Another factor in well operation is the keeping of good well water supply records. Daily, monthly, and yearly records should be kept of static levels, drawdown, pumping levels, specific capacity, gallons per minute, hours of operation, kilowatt hours and amount of chemicals fed. (Smith-NWWA)
W73-10714

CONTROLLING FLOWING ARTESIAN WELLS,
Bureau of Reclamation, Denver, Colo. Div. of Drainage and Groundwater Engineering.
T. P. Ahrens.
Water Well Journal, Vol 23, No 3, p 18-19, March 1969. 1 fig.

Descriptors: Wells, Water wells, *Artesian wells, Artesian heads, *Cement grouting, Drilling fluids, Bentonite, Grouting, Well casing, Slurries.
Identifiers: Annular space, Well packers, *Flowing artesian wells, Ontario.

A number of methods are available to control artesian flows which occur after a well is drilled. Factors determining which method is to be used are: stratigraphy of the area; depth, diameter, and design of the well, including location of perforations; method of construction of the well; and pressures and volumes of flow encountered. A procedure for controlling three Canadian wells is outlined. Basically, the method consists of using a bentonite mud to temporarily completely shut off the flow of water in both casing and annular space, and then displacing the mud with cement from the bottom by means of a perforated drop pipe. It is emphasized that all equipment and materials should be assembled at the work site in order that the cement be placed before the mud gels. If the mud gels, higher pumping pressures are required for displacement of the mud. Although not inexpensive, this procedure should be cheaper than drilling a new well. (Campbell-NWWA)
W73-10718

EFFECTIVE MIXING IN SHALLOW BODIES OF WATER WITH AND WITHOUT DENSITY STRATIFICATION,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05D.
W73-10719

ACIDIZING BOREHOLES,
A. H. Stow, and L. Renner.
Journal of the Institution of Water Engineers, Vol 19, No 8, p 557-572, November, 1965. 1 fig, 5 append.

Descriptors: Wells, Water wells, *Acids, Carbonates, *Carbonate rocks, Sandstones, *Boreholes, Phosphorus compounds, Inhibitors, Grouting, Cement grouting, Limestone, Drilling.
Identifiers: Chalks, *Acidizing, *Development (Wells), Hydrochloric acid, Acetic acid, Phosphoric acid, Nitric acid.

Acid may be used in water well work to (1) Remove debris (from drilling) from test-pump discharge; (2) Remove slurry from the walls of a well or borehole, and to clear fissures at their entry into the well or borehole; (3) Develop and increase the yield; (4) Reduce friction loss to give more economic pumping. The reaction of acids with carbonates may be used to develop and to increase the yield of both carbonates and some (carbonate-cemented) sandstones. In considering the acidizing of a borehole, the following information is required: Dimensions of the borehole, depth to static water level, depth of grouted lining, details of overburden, geological description of exposed strata, yield and direction and velocity of groundwater flow, positions of boreholes within a 1/2 mile radius, and facilities for disposal of test-pumping water. Inhibitors and placement procedure are discussed; various acids and their properties are given in appendices. (Campbell-NWWA)
W73-10787

A NEW MATERIAL TO CEMENT WELL CASING,
Cities Service, Co., Corpus Christi, Tex.
For primary bibliographic entry see Field 08F.
W73-10788

EFFICIENCY OF VARIOUS METHODS OF DRILLING WELLS FOR WATER SUPPLY,
A. G. Danilov, A. M. Danilov, and V. I. Kovalev.
National Water Wells Association Translation. Trans. from Gidrotekhnika i Melioratsiya, p 91-95, February, 1973. 2 fig, 3 ref.

Descriptors: Wells, *Water wells, Drilling, *Drilling equipment, Drilling fluids, Drilling samples, *Rotary drilling, Unconsolidated aquifers, Hydrogeology, Exploration.
Identifiers: *Cable-tool drilling, USSR.

In drilling for water, the yields (water yield measured in gpm/ft. of drawdown) of wells drilled by the cable tool method were 4 - 10 times greater than the yields of those drilled by the rotary method. The rotary method showed a drilling rate (meters/machine-month) only 2.5 - 3.0 times higher than that with cable tools. In detailed hydrogeological exploration for defining the problems in obtaining a water supply for irrigation and drainage in districts where the aquifer is unconsolidated and fragmentary (river valleys, foothills, interfluves, etc.) the cable tool method is economical and ensures a high quality of hydrogeological information and a large well yield. In hydrologically well-explored districts where the aquifers lie at depths of from 300-800 meters and have high artesian pressures the rotary method should be applied. (Smith-NWWA)
W73-10789

WELL STIMULATION--HOW ACIDS BEHAVE IN SOLUTION,
Marathon Oil Co., Tex.
H. K. VanPoolen.
Oil and Gas Journal, Vol 65, No 39, p 100-102, September 25, 1967. 1 tab, 2 ref.

Descriptors: *Acids, Oil industry, Wells, Ions, *Ionization, Calcium chloride, Calcium sulfate, Iron, Aluminum, Sodium compounds, *Chemical precipitation, Chemical reactions, Equations, Equilibrium, *Hydrogen ion concentration.
Identifiers: Sequestering agents, Weak acids, Buffered solutions, Hydrochloric acid.

Problems and solutions of acidizing boreholes to increase yield are given. The pH of solutions in general and of weak acid solutions is explained, along with why careful pH control is sometimes very important. Secondary precipitation, the dissolution of certain substrances in fresh acid and precipitation of these materials when the acid becomes spent, is explained, and substances which may give trouble in this regard are listed. The use of buffers to prevent the pH of a solution from rising above a critical value causing the secondard precipitation of iron or aluminum is outlined. Another approach to the problem of secondary precipitation, with calcium sulfate, is the prevention of the initial dissolution of calcium by the common ion effect. The control of secondary precipitation may also be accomplished by reduction of the cation concentation below the level necessary to cause precipitation. This is accomplished by the use of a sequestering agent which, for calcium sulfate, is sodium hexametaphosphate. (Smith-NWWA)
W73-10792

WELL DRILLING IN SOUTHEAST ASIA,
Camp, Dresser and McKee, Boston, Mass.
R. E. Preble.
New England Water Works Association Journal, Vol 85, No 2, p 132-138, (1971). 2 fig.

Descriptors: Wells, Water wells, Drilling, *Drilling equipment, *Asia, Rotary drilling, History, Groundwater, *Groundwater availability, Deltas, Unconsolidated aquifers.
Identifiers: *Developing countries, Cable tool drilling, Reverse-circulation rotary, Manual labor.

Problems related to groundwater development in Asia include (1) Scarcity of basic geological information for planning; (2) Insufficient number of qualified professionals; (3) Inadequate road network; and (4) Shortage of parts and supplies for drill rigs and accessories. Although in recent years most countries of S. E. Asia have started to employ modern equipment and techniques, many

wells today are still being installed by centuries-old hand methods. Methods of well drilling without power-driven equipment are explained in detail. Success of hand methods depends upon conditions encountered. The reverse rotary process is the ideal power operated method of drilling wells in flat deltaic areas of the region's major rivers. In developing countries, standard size wells are generally constructed with the same screen diameter regardless of the desired pumping rate. Often, this leads to excessive drawdowns and unnecessary power costs. (Smith-NWWA)
W73-10795

DRILLING FOR WATER IN NEW ENGLAND,
Geological Survey, Montpelier, Vt.
A. L. Hodges, Jr.
New England Water Works Association Journal, Vol 82, No 4, p 287-315, December, 1968. 10 ref.

Descriptors: Wells, Water wells, *Drilling, Drilling equipment, Unconsolidated aquifers, Rotary drilling, Well casings, Wells screens, Groundwater, *Groundwater availability, *Water supply development, Water table aquifers, Deep wells, Pumps, Gravels, *Northeast U.S.
Identifiers: Rock wells, Crystalline rocks, Sedimentary rocks, *Yields of wells, Well development.

The down-the-hole hammer, or rotary percussion method of drilling has gained rapid acceptance in New England since its inception in the 1950's and today supplements to a great extent the older cable tool method. Test drilling as a method for choosing the best location for a water well is recommended. The relative advantages and disadvantages of unconsolidated and consolidated aquifers, where both types are available, are given. Types of hole excavation for wells covered include dug wells, driven wells, jetted wells, bored wells, infiltration galleries, well fields of the aforementioned, and drilled wells constructed by various methods. Methods of casing and screen emplacement covered include the retracted-casing method, the baildown method, and the washdown method. Gravel packing is discussed in detail. A summary of yields of wells in various rock types is given. Well development methods, including overpumping, surging, dry ice, compressed air, and horizontal jetting, are discussed. A section on water well pumps includes discussions on pump types and pump selection. (Campbell-NWWA)
W73-10796

WELL DEVELOPMENT OF SAND AND GRAVEL AQUIFERS,
D. Ault, and R. N. Bethart.
Water Well Journal, Vol 23, No 3, p 20-22, March, 1969. 2 fig.

Descriptors: Groundwater, Gravels, *Unconsolidated aquifers, Well screens, *Particle size, Sand aquifers, Acids, Pumping, Jets, Wells, *Water wells.
Identifiers: *Well development, Bridging (Particles), Compressed air.

Differing methods of development of sand and gravel aquifers are presented, each having its advantages and disadvantages. Acid treatment is today often used in initial well development procedures and will clean up the formation for a considerable distance outside the well screen. A solution of either dry or wet acid is prepared and introduced into the well, agitated several times during a 12 to 24 hour soaking period, and is flushed out thoroughly by pumping the well. Overpumping, or the pumping of a well at a higher capacity than that of the permanent pump, often works very well on large capacity wells, especially when used in conjunction with other well development methods. The use of compressed air is the best method under certain conditions, but it requires the use of considerable equipment. A number of variations have been used when developing by air. Probably the most effective over-all method of well developing, however, is using water in a jet washing tool, which consists of directing high velocity streams of water at right angles into the formation. (Smith-NWWA)
W73-10798

GROUNDWATER WELLS SERVE MINING INDUSTRY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
G. F. Briggs.
Industrial Water Engineering, Vol 6, No 7, p 22-25, July, 1969. 4 fig.

Descriptors: Wells, Water wells, Mine water, *Mineral industry, *Dewatering, *Leaching, Kaolinite, *Georgia, Mineral water, Brines, Chlorides, Magnesium, Magnesium compounds, Well screens, Drawdown, Alloys, Corrosion, Transmissivity.
Identifiers: Nitric acid, Uranium ore, *Ore bodies.

Lowering the water table over an area to be excavated as an open pit involves creating a composite cone of depression by pumping from a series of properly spaced wells. An example of application of this technique is given in a Georgia kaolin mining pit dewatering project. Six dewatering wells were used, each pumping about 3,000 gpm, in order to lower the water table 55 to 60 ft. over an area 2500 ft by 600 ft. Inplace leaching of uranium ore is also discussed as another area in which ground water technology can be useful in the mining industry. A cold nitric acid solution containing an oxidant and flocculant is injected into the ore zone through injection wells located around a central recovery well. As the leaching solution is put into the injection wells, a cone-shaped, fluid-pressure mound builds up in the porous medium around each well. Pumping from the recovery well is done at a rate equal to the total input of leach solution. This type of well application, of course, requires casing and screen materials which are highly corrosion resistant. An example where the mineralized formation water itself was a raw material--in this case 11 to 12% magnesium chloride--is also given. (Smith-NWWA)
W73-10799

8B. Hydraulics

A FINITE ELEMENT SOLUTION FOR TWO--DIMENSIONAL DENSITY STRATIFIED FLOW,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 02H.
W73-10418

DIVIDING FLOW IN CLOSED CONDUITS,
Beck (R. W.) and Associates, Seattle, Wash.
J. V. Williamson, and T. J. Rhone.
Paper, ASCE Natl Water Resour Eng Meet, Phoenix, Ariz, Jan 1971. 39 p, 14 fig, 26 ref, 2 append.

Descriptors: *Head loss, Friction, Prototype tests, Energy loss, Velocity, *Closed conduits, Pressure conduits, Hydraulic models, Hydraulic design, *Hydraulic conduits, Reynolds number, Flow resistance, Bibliographies, Research and development, Penstocks.
Identifiers: Experimental models, *Wye Branches.

The paper constitutes a progress report by the ASCE Task Committee on Branching Conduits. A historical review of many investigations and general experiments on energy losses for dividing flow in hydraulic conduits is presented with extensive analyses. Laboratory research studies are compared for symmetrical wye branches, manifolds, and standard and tapered branches. Special shapes are discussed. New designs by Escher Wyss and Krupp are described, and the results of field and laboratory studies are presented. The studies show that losses for 45- and 60-deg branches are not greatly different, but are less than for 90 deg. As the diameter ratio decreases, losses increase, but not significantly. Losses for conical wyes are generally less than those in single laterals. An internal tie rod or a spherical junction causes large losses it special inserts are not used to improve hydraulic efficiency. The angle of a conical transition should be between 10 and 15 deg for least loss. Prototype head losses are likely to be less than those obtained in model studies. (USBR)
W73-10608

GUIDELINES FOR HYDRAULIC CONSIDERATIONS IN HIGHWAY PLANNING AND LOCATION.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design.

American Association of State Highway Officials Publication, 1973. 4 p, 2 ref. Highway Drainage Guidelines: Vol. I.

Descriptors: *Road construction, *Road design, *Hydrologic aspects, *Hydrology, *Design criteria, Highways, Streams, Data collections, Hydrologic data, Floods, Flood frequency, Topography, Geology, Drainage effects, Vegetation, Mapping, Aerial photography, Land use, Reviews, Planning.
Identifiers: Guidelines, Highway locations.

Water and related climatic factors are important considerations in planning and locating highways. The effect of the highway construction on the existing drainage pattern and on the potential flood hazard, as well as the effect of floods on the highway, must be assessed in the preliminary planning and design stages. Often hydraulic factors are closely related to the environmental, ecological and economic aspects of the location of a new highway and critical evaluations must be made in the planning process, requiring compromises and a searching for alternate solutions and routes. Some drainage, flood, and water quality problems can be easily recognized and resolved; others may require extensive investigation before an adequate and satisfactory solution can be developed. Specialists experienced in hydrology and hydraulics can contribute substantially to the planning and location of a highway project by recognizing potentially troublesome locations, making necessary investigations, and recommending practical solutions. Hydrologic and hydraulic data, preliminary calculations and analyses, all information used in developing conclusions and recommendations related to drainage requirements, including estimates of structure size and location, should be compiled in a report. Such a report serves as documentation and back up for decisions on route location and is an excellent reference for more detailed studies needed in preparing construction plans. (See also W73-10658) (Woodard-USGS)
W73-10657

GUIDELINES FOR HYDROLOGY.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design,

American Association of State Highway Officials Publication, 1973. 23 p, 2 fig, 1 tab, 45 ref. Highway Drainage Guidelines, Vol 2.

Descriptors: *Road construction, *Road design, *Hydrologic aspects, *Hydrology, *Design criteria, Highways, Data collections, Streams,

Floods, Flood frequency, Topography, Geology, Drainage effects, Vegetation, Mapping, Aerial photography, Hydrologic data, Land use, Reviews, Planning.
Identifiers: Guidelines, Highway locations.

Hydrologic analysis is a most important step prior to the hydraulic design of a highway drainage structure. Such an analysis is necessary for determining the rate of flow, runoff, or discharge that the drainage facility will be required to accommodate. The design discharge is a hydraulic load on the highway facility and the determination of the proper structural load. These guidelines give a recommended approach to the hydrologic analysis for the design of highway drainage facilities. Highway drainage facilities range from very small culverts and channels to multimillion dollar storm drains and bridges. Although some hydrologic analysis is necessary for all highway drainage facilities, the extent of such studies should be commensurate with the importance of the structure. The documentation of a hydrologic analysis is the compiliation and preservation of all pertinent information on which the hydrologic decision was based. This might include drainage area and other maps, field-survey information, source references, photographs, hydrologic calculations, flood-frequency analyses, stage-discharge data and flood history, which includes narratives from highway maintenance foremen and local residents who witnessed or had knowledge of an unusual event. (See also W73-10657) (Woodard-USGS)
W73-10658

EFFECTS OF TIME STEP SIZE IN IMPLICIT DYNAMIC ROUTING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 02E.
W73-10676

COASTAL EROSION IN THE NILE DELTA,
United Nations Educational, Scientific and Cultural Organization, New York.
For primary bibliographic entry see Field 02J.
W73-10681

THE FEASIBILITY OF FLOW SMOOTHING STATIONS IN MUNICIPAL SEWAGE SYSTEMS,
Research Triangle Inst., Durham, N.C.
For primary bibliographic entry see Field 05D.
W73-10722

THE HEALTH AND CARE OF WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
R. L. Schreurs.
Journal of the American Water Works Association, Vol 62, No 7, p 434-436, July, 1970. 2 fig, 4 ref.

Descriptors: Wells, *Water wells, Groundwater, Well data, Well spacing, Iron bacteria, Iron oxides, Well screens, Graphical analysis, *Maintenance, Drawdown, Observation wells, Water levels, *Water level fluctuations, Pumping.
Identifiers: Incrustation, *Record keeping, Well yield, Pumping levels.

The longevity of a well depends on various factors--care used in construction, materials used, local geology and quality of groundwater, operation of the well, and maintenance. Causes of shortened well life include reduced pumping rate because of pump water or by a change in surface piping, lowering of the static water level, interference from nearby wells, lowering of the pumping level because of hydrologic influences, and clogging of the aquifer outside the well screen. An analysis of well problems using pumping rates and water levels plotted on graphs is shown. Pump failure, chemical incrustation, bacterial clogging, and lowering of static level can be determined using graphic methods. Proper record keeping is emphasized as the most effective means of maintaining well performance and saving large expenses by making it possible to monitor slight changes in well performance and to take early corrective action. (Smith-NWWA)
W73-10794

CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY,
Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W73-10881

MAXIMUM BREAKER HEIGHT,
Army Coastal Engineering Research Center, Washington, D.C.
J. R. Weggel.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW4, Paper 9384, p 529-548, November 1972. 9 fig, 3 tab, 19 ref, 3 append.

Descriptors: *Coastal engineering, *Coastal structures, *Ocean waves, *Breakwaters, Design criteria, Mathematical studies, Mass curves, Analytical techniques, Shore protection.
Identifiers: *Ocean wave breakers, Maximum wave breaker height.

Based on a reevaluation of available experimental data on breaking waves, a relationship between the breaker height-breaking depth ratio, the incident wave steepness and the beach slope is found. This relationship, when combined with experimental observations of breaker travel, permits an estimate of the maximum breaking wave height a coastal structure might experience given a design wave period and design depth at the structure site. Breaker-type classification according to inshore and offshore parameters as presently defined cannot be reconciled to observations of the relationship between breaker-height index, wave steepness, and beach slope. Revised criteria for breaker classification are presented. (Woodard-USGS)
W73-10975

CHARACTERISTICS OF WAVE RECORDS IN THE COASTAL ZONE,
Army Coastal Engineering Research Center, Washington, D.C.
D. L. Harris.
CERC Reprint 2-73, 1973. 51 p, 19 fig, 6 tab, 28 ref. (reprint from Waves on Beaches and Resulting Sediment Transport: Academic Press, Inc., 1972.)

Descriptors: *Ocean waves, *Beach erosion, *Waves (Water), *Oceanography, Measurement, Methodology, Mathematical studies, Energy equation, Gages, Aerial photography, Correlation analysis, Shore protection, Coastal engineering, Design criteria.
Identifiers: Ocean wave gaging, Wave record analysis.

Records from several types of ocean wave gages in coastal zones have been compared to obtained a measure of instrumental reliability. It is found that pressure records, as properly corrected, may give a better measure of surface waves, than some gages which record the surface elevation directly. An examination of the spectra computed from the records of a five-gage array of pressure gages at Pt. Mugu, California, provides evidence that the true spectra consist of a group of narrow spikes, not a smooth continuous function of frequency as often assumed. Data from Pt. Mugu and several east coast wave stations show that multinodal spectra are common in coastal locations. The frequency of maximum energy density in the pressure spectra is frequently different from that of the surface spectra or the velocity spectra. Photographs of waves from space are used to show that long crested waves with no more than slight variation in direction do occur in the ocean. Aerial photography of a coastal region is used to show that wave conditions can vary significantly within short distances in the coastal region. (Woodard-USGS)
W73-10979

FREE-SURFACE IDEAL FLUID FLOWS BY FINITE ELEMENTS,
Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineering.
S. T. K. Chan, B. E. Larock, and L. R. Herrmann.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9787, p 959-974, June 1973. 6 fig, 20 ref, 3 append.
NSF Grant GK-4789.

Descriptors: *Open channel flow, *Finite element analysis, Computer programs, Hydraulics, Hydrodynamics.
Identifiers: Free-surface flows.

The two-dimensional flow of an ideal fluid which emerges as a free surface jet from a containing vessel of arbitrary shape is studied. The finite element analysis of this problem seeks an approximate solution for the minimization of a functional which describes this problem. Gravity effects and curvilinear, solid boundary walls are easily taken into account. The method provides a rational analytical algorithm for adjusting free surface coordinates. The iterative technique used in conjunction with the algorithm requires the solution of a linear, symmetric, banded equation system during each iteration, which is quickly done Gaussian elimination. Results include not only free surface profiles but also velocity and pressure distributions throughout the flow domain. Computational examples are given which required 10-20 iterations and used 3 min to 8 min of execution time on the IBM 7044 computer. (Knapp-USGS)
W73-10988

ACCELERATED MOTION OF A SPHEROID IN VISCOUS FLUID,
Wisconsin Univ., Milwaukee. Dept. of Energetics.
For primary bibliographic entry see Field 02J.
W73-10989

COMPARISON OF BRIDGE BACKWATER RELATIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02E.
W73-10990

FRICTION FACTOR AND REYNOLDS NUMBER IN POROUS MEDIA FLOW,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering.
For primary bibliographic entry see Field 02F.
W73-10991

THE EFFECT OF SILTING ON FLOW PROFILE UPSTREAM OF WEIRS--A CASE STUDY,
B. D. Suryavanshi.
Irrigation and Power (India), Vol 29, No 4, p 429-437, October 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Reservoir silting, *Weirs, *Flow profiles, *Stage-discharge relations, Hydraulic models, Sedimentation.
Identifiers: *India (Wainganga River).

The Dhuti weir is a diversion work across the Wainganga River in Balaghat district of Madhya Pradesh, India. To test the effects of silting behind the weir, a geometrically similar sectional model was constructed in a 0.915-m-wide flume to a scale

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ratio of 1/24. Silting upstream of weirs decreases the depth of water over crest for the same discharge. This factor should be taken into account while using these structures for assessing the discharge in the rivers. Flooding upstream of weirs increases beyond the computed levels with original bed levels when accretion of silt takes place upstream. (Knapp-USGS)
W73-10994

UPLIFT PRESSURE BELOW HORIZONTAL APRON WITH CUTOFF AT INTERMEDIATE POINTS, FOUNDED ON ANISOTROPIC PERVIOUS MEDIUM OF FINITE DEPTH,
Jodphur Univ. (India).
B. C. Punmia, and S. C. Patwa.
Irrigation and Power (India), Vol 29, No 4, p 391-406, October 1972. 18 fig, 3 tab, 9 ref.

Descriptors: *Seepage, *Uplift pressure, *Dam design, *Analog models, Groundwater movement, Soil water movement.

The effects of finite depth and anisotrophy of the soil medium on seepage under weir aprons, with cutoffs at various positions, were studied using analog models. Theoretical solutions were based on Pavlovsky's analysis, taking into account the anisotropy of the soil medium. The principal parameters investigated are the total base width of the apron; the widths of the apron upstream and downstream of the cutoff pile; the depth of the pile; the depth of porous medium; and the anisotropy ratio. (Knapp-USGS)
W73-10995

FORMATION OF CAVITY IN CONFINED AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
A. P. Mishra, and B. Anjaneyulu.
Irrigation and Power (India), Vol 28, No 3, p 241-244, July 1971. 3 fig, 8 ref.

Descriptors: *Water wells, *Aquifers, *Confined water, *Hydraulic models, Tubes, Dimensional analysis, Analytical techniques, Equations, Correlation analysis, Design criteria, Drawdown, Sands.
Identifiers: *Cavity wells, Cavity formation, Predicting cavity dimensions.

A type of tube-wells kntiown as cavity wells which have no strainers is preferred by the farmers because of low cost of construction. These wells draw water through a cavity formed below the well pipe in a confined aquifer. The boring is carried out through the entire upper confining clay layer up to the underlying sand layer and pumping is started. At the beginning, large quanties of sand come out along with discharge, but after some time the discharge will be free from sand which signifies that a stable cavity has been developed. The cavity should be developed to the safe limit of bearing capacity of upper confining layer; but in actual well it is not possible to measure the size of cavity developed. Experiments were conducted on the sand model of a tube-well in a confined aquifer to determine the shape and size of cavity formation. An equation based on dimensional analysis was used to predict the size of cavity formed in an aquifer of particular thickness when the diameters of particles and working drawdown are known. A nomograph is presented to avoid mathematical computations. For all the materials the shape of the cavity was parabolic when the top surface was circular. (Woodard-USGS)
W73-10996

8C. Hydraulic Machinery

LOADING AND DESIGN OF TRANSMISSION TOWERS,
Bureau of Reclamation, Denver, Colo.
H. Brenman.
Paper, ASCE Special Conference on Safety and Reliability of Metal Structures, Pittsburg, Pa., Nov 1972. 22 p, 6 fig, 5 ref.

Descriptors: *Transmission towers, Transmission lines, *Reliability, Erection, Structural design, Maintenance, Loads (Forces), Ice, Fabrication, Construction, Inspection, Snow, Wind pressure, Winds, Design criteria, Electric cables, Transmission (Electrical), Yield strength.
Identifiers: Transmission line hardware, National Electrical Safety Code, Overloads.

Modern civilization is so intimately dependent on electrical energy that the need for continuous delivery is unquestioned. The reliability and strength of transmission towers play a major role in the uninterrupted delivery of power. Methods of ensuring reliability in transmission towers are discussed. Each tower must be designed to support the transmission conductors, insulators, and hardware under all conditions other than unforeseeable catastrophes if delivery of power is to be uninterrupted. Most transmission lines require at least 3, sometimes 6 or 7, different types of either suspension or tension towers. Two major factors influencing structural reliability of transmission lines are: (1) loads, and (2) tower design. Other elements discussed include tower fabrication, foundation design and construction, erection, and periodic inspection and maintenance. (USBR)
W73-10616

THE CLUSTER LAYOUT--A NEW CONCEPT FOR PUMPER-STORAGE,
Bechtel Corp., San Francisco, Calif.
J. G. Patrick.
Water Power, Vol 24, No 9, p 339-345, Sept 1972. 10 fig, 1 tab.

Descriptors: *Pumped storage, Hydroelectric power, Pump turbines, Structures, *Underground powerplants, Underground structures, Structural design, Economics, Safety, Environmental effects, Feasibility studies, Cost comparisons, Submergence, Stress analysis.
Identifiers: Underground cavities, Layout, *Powerhouses.

Increasing use of pumped storage projects has caused rapid development of reversible pump turbine units. Increase in unit size and unit head has been remarkable, and the design of these modern high-speed, high-head units requires deeper submergence of the pump turbine unit below minimum level of the lower reservoir than required for a turbine only. The pumped storage plant usually has been an adaptation of a conventional powerplant. Additional submergence and drawdown at the lower reservoir have created costly design problems when using conventional powerplant designs. A new concept for pumped storage plants--the cluster design--offers a better solution to design requirements than conventional arrangements. The cluster design is described; advantages in design, safety, operation, cost, and environment are enumerated. Stresses in the rock surrounding the underground cavity are substantially lower for cluster powerhouses than for conventional underground powerhouses. (USBR)
W73-10618

HYDRAULIC JETTING, DRILLING TOOL AIDS DIRECTIONAL WORK,
Continental Oil Co., New Orleans, La.
R. E. McKee.
Oil and Gas Journal, Vol 69, No 12, p 146-148, March 22, 1971. 2 fig.

Descriptors: Drilling, Drilling fluids, *Hydraulic equipment, Hydraulic machinery, *Drilling equipment, Jets, Oil industry, Offshore platforms.
Identifiers: Jetting, *Directional drilling, Drill bits, Hydraulic horsepower.

A tool is discussed which adds to jet-deflecting efficiency for directional-hole surge pump, significantly increases instantaneous jet impact, bit horsepower, and nozzle velocity. A comparison test between jetting with surface pumps and the hydraulic jetting drilling tool showed a fourfold increase in bit horsepower with the rig using the hydraulic jetting drilling tool over the one without. The tool is operated by picking up the drill string until the bit is suspended a short distance off the bottom. At this time the tool is at its full extension and its fluid chamber is full. The string is then slacked off with the pumps on. At the instant the bit touches bottom, the string must be traveling at a rate sufficient to close the tool in .50 to .75 sec. After the bit reaches bottom, the drill string continues to move downward, forcing a stream of mud through the bit jets at a rate much greater than if the pumps were working alone. (Campbell-NWWA)
W73-10717

WELL DRILLING IN SOUTHEAST ASIA,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 08A.
W73-10795

AIR BLAST DRILLING WITH ROTARY ROCK BITS,
Chicago Pneumatic Tool Co., Ill.
J. B. Coulter, Jr.
Water Well Journal, Vol 23, No 3, p 29-34, March, 1969. 2 charts.

Descriptors: Drilling, Rotary drilling, *Drilling equipment, Boreholes, Drilling fluids, Bearings, *Rock mechanics, Lubricants, Friction.
Identifiers: *Air rotary drilling, Drill bits, Drilling parameters, Compressors.

The most important part of air drilling is at the bottom of the hole where the air meets the cuttings. It is at this point that the success or failure of the application of air to rotary drilling is determined. Field data indicate that conventional flow or low pressure nozzles are more efficient than jet types nozzles for air drilling because there is less total effect at the bottom of the hole, expecially between the cones and the head section of the bit. A full opening or reduced full opening air course through the center of the head section to direct the air flow on top and part the cutter elements is recommended. Bearing lubrication is not a problem in air drilling, provided enough air volume flows through the bearings to prevent heat buildup. Drilling rates and total footage per bit are substantially greater when drilling with air as opposed to mud provided a sufficient volume of air is maintained to prevent chip recutting. A classification scheme for evaluation of dull bits is presented. (Campbell-NWWA)
W73-10797

8D. Soil Mechanics

UPLIFT PRESSURE BELOW HORIZONTAL APRON WITH CUTOFF AT INTERMEDIATE POINTS, FOUNDED ON ANISOTROPIC PERVIOUS MEDIUM OF FINITE DEPTH,
Jodphur Univ. (India).
For primary bibliographic entry see Field 08B.
W73-10995

8E. Rock Mechanics and Geology

A MODEL STUDY OF ROCK-JOINT DEFORMATION,
Norwegian Geotechnical Inst., Oslo.
N. R. Barton.
Int J Rock Mech Min Sci, Vol 9, No 5, p 579-602, Sept 1972. 15 fig, 8 tab, 23 ref.

Descriptors: *Joints (Geologic), *Fractures (Geologic), Model studies, *Faults (Geologic), Deformation, Rocks, Finite element analysis, Foreign research, Reviews, Rock mechanics, Rock properties, Engineering geology, Shear strength, Numerical analysis, Bibliographies.
Identifiers: Norway, Residual strength, Horizontal fractures.

Because of difficulties in numerically simulating jointed rock a widespread move toward physical modeling may contribute to obtaining better joint characteristics values. Existing rock-joint modeling techniques are reviewed. One physical modeling method produces mating tension fractures in a weak, brittle model material using a large guillotine device. Parallel sets of model joints can be produced which are continuous, cross-jointed or offset. Direct shear properties of these 3 types are compared and evaluated. Recent numerical modeling of jointed rock masses has been based on assumed values of the shear and normal stiffness of the joints. These components dominate the elastic deformation properties of the intact rock. Results of shear and normal stiffness tests on the model joints are used to assess these quantities. Shear stiffness depends upon both normal stress and size. For a given normal stress, an inverse proportionality exists between test dimension and shear stiffness. Normal stiffness depends on the preconsolidation or virgin normal stress level. Problems of simulating behavior of jointed rock masses by the finite element method are reviewed. (USBR)
W73-10607

AIR BLAST DRILLING WITH ROTARY ROCK BITS,
Chicago Pneumatic Tool Co., Ill.
For primary bibliographic entry see Field 08C.
W73-10797

8F. Concrete

IMPREGNATION OF CONCRETE PIPE.
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 08G.
W73-10419

FACTORIAL EXPERIMENTS IN CONCRETE RESEARCH,
James Cook Univ. of North Queensland, Townsville (Australia).
D. M. F. Orr.
Journal of American Concrete Institute, Proceedings, Vol 69, No 10, p 619-624, Oct 1972. 2 fig, 9 tab, 5 ref.

Descriptors: Cements, Compressive strength, *Concretes, *Statistical methods, Temperature, *Concrete technology, Statistics, Methodology, Research and development, Foreign research, Australia.
Identifiers: Factor analysis, Cement content, *Factorial experiments.

Single factor experiments conducted to investigate different responses of concrete could mask true effects because interactions among factors may occur. In such circumstances, using the factorial type of experiment is desirable. Further advantages of this technique are: (1) a check can be made on the precision of an experiment, and (2) errors can be identified. An example of the technique is presented, using cement temperature, initial mix temperature, cement composition, and water-cement ratio as factors. The anomaly in the analytical results was traced through calculations to the source–the testing laboratory. Significant interactions were found, indicating that conventional single factor experiments can mask true effects. Whenever interactions are suspected, the factorial technique should be used. (USBR)
W73-10609

SUGGESTED DESIGN AND CONSTRUCTION PROCEDURES FOR PIER FOUNDATIONS.
American Concrete Inst., Detroit, Mich. Committee 336.

Journal of American Concrete Institute, Proceedings, Vol 69, No 8, p 461-480, Aug 1972. 11 fig, 40 ref, append.

Descriptors: *Concrete construction, *Foundations, Excavation, *Structural design, Construction materials, Earth pressure, Reinforced concrete, Quality control, Concretes, Deflection, Linings, *Inspection, *Piers, Soil mechanics, Bibliographies, Loads (Forces).

Suggested design and construction procedures are presented for foundation peirs 2 ft 6 in. in diameter, or larger, made with plain concrete or reinforced concrete. This report by ACI Committee 336 is limited to piers constructed by digging, drilling, or otherwise excavating holes in the soil, later filled with concrete, and does not include rectangular piers or spread footings in deep excavation. While structural design and construction is the primary topic, the influence of soil mechanics is also considered. Combined attention of designer and constructor is essential for the successful design and construction of pier foundations to establish the necessary interrelation with the surrounding and supporting soil or rock. Design of piers includes: (1) determining overall pier size, and (2) a detailed design procedure of the concrete pier. Emphasis is placed on item (1) involving interaction between soil and pier, with item (2) referenced to ACI 318-71 (Building Code Requirements for Reinforced Concrete) or ACI 322. Construction methods described include excavation, casing, and placement of concrete and steel. Recommended procedures for inspection and evaluation and criteria for acceptance are presented. (USBR)
W73-10611

THE SAN FERNANDO EARTHQUAKE: A LESSON IN HIGHWAY AND BRIDGE DESIGN,
California State Div. of Highways, Sacramento.
For primary bibliographic entry see Field 08A.
W73-10612

A NEW MATERIAL TO CEMENT WELL CASING,
Cities Service, Co., Corpus Christi, Tex.
D. L. Oliver, and F. T. Jones.
Oil and Gas Journal, Vol 67, No 41, p 95-96, October 13, 1969. 1 tab.

Descriptors: Wells, Grouting, *Cement grouting, Well casing, *Drilling fluids, Logging (Recording), Oil industry, Slurries, Testing, Testing procedures, Drilling equipment, Rotary drilling, *Materials testing, Concretes, Concrete placing, On-site tests.
Identifiers: Cement bond logging, Drilling mud.

A new material allows drilling fluids to be used in preparing custom slurries for down-hole casing cement. The mud-concrete product can be used in any water-based mud and will tolerate normal amounts of oil and diesel fuel in the mud. Two useful qualities of this slurry are: (a) the mud-concrete slurry does not contract when setting; and (b) the slurry is completely compatible with the drilling fluid system. Other advantages include: (1) except for low temperature slurries, the extended setting time of the mud cement at ambient temperatures will permit the optimum use of central mixing plants in active drilling areas; (2) reduced material requirements; (3) easy control of setting through use of retarders; (4) compressive strengths after 24 hr. generally above 500 psi, which is normally considered adequate; (5) easy control of slurry weight in pressure sensitive zones. Field test results on two differeent wells are given. (Campbell-NWWA)
W73-10788

8G. Materials

IMPREGNATION OF CONCRETE PIPE.
Southwest Research Inst., San Antonio, Tex.

Environmental Protection Agency, Water Pollution Control Research Series, June 1971. 73 p, 14 fig, 4 tab, 22 ref. EPA Program 11024 EQE, Contract 14-12-835.

Descriptors: Concrete, *Concrete pipes, Corrosion, *Corrosion control, Protective coatings, *Sewers, Sulfur, Hydrogen sulfide, Resins.
Identifiers: *Impregnation, *Hydrofluoric acid, Acid resistance, Bacterial action, Sulfate resistance.

Methods to increase the corrosion resistance, increase the strength, and reduce the permeability of concrete used in sewer line applications by impregnating the concrete pipe with relatively low cost resins such as asphalt, coal tars, linseed oil, sulfur, urea-formaldehyde, and others were investigated. The materials, techniques of application, test results and economics are presented. A large number of candidate impregnation materials were obtained and screened both in the laboratory and in limited field tests. Dilute hydrofluoric acid, sulfur and modified sulfur were found to impart the best corrosion resistance by impregnation. Other materials including vinyl-vinylidene chloride, vinyl acetate-acrylic, nitrile rubber latex, nitrile phenolic rubber, an emulsified reclaimed rubber and a rubber base adhesive, although failing to impregnate the concrete, formed surface coatings having exceptional corrosion resistance. (EPA)
W73-10419

PRACTICAL INTERFERENCE CURRENT TESTING ON UNDERGROUND METALLIC STRUCTURES,
Tennessee Gas Pipeline Co, Houston, Tex.
R. L. Seifert.
Materials Protection and Performance, Vol 11, No 10, p 41-49, Oct 1972. 17 fig.

Descriptors: *Corrosion, *Corrosion control, *Pipelines, *Underground structures, Structures, Metals, Metal pipes, Electrodes, Electrolysis, Cathodic protection, Rectifiers.
Identifiers: Galvanic protection systems, *Corrosion currents, *Stray current corrosion, Galvanic corrosion.

Step-by-step methods for handling stray current interference problems on underground metallic structures are presented. Stray currents of both static and dynamic characteristics are considered. Since interference problems are not encountered regularly prior to making interference tests, corrosion control personnel often must review the procedures. The literature is reviewed and a guide presented to aid both experienced and inexperienced corrosion control personnel. Specific interference problems ranging from simple categories to complex examples given in simple and concise terms may be adapted singularly or in combination to solve virtually every interference problem encountered. Pitfalls in establishing interference currents are discussed. (USBR)
W73-10610

SUGGESTED DESIGN AND CONSTRUCTION PROCEDURES FOR PIER FOUNDATIONS.
American Concrete Inst., Detroit, Mich. Committee 336.
For primary bibliographic entry see Field 08F.
W73-10611

FATIGUE OF STEEL WELDMENTS,
Jones and Laughlin Steel Corp., Pittsburgh, Pa.
B. Pollard, and R. J. Cover.
Welding Journal, Vol 51, No 11, p 544s-554s, Nov 1972. 8 fig, 6 tab, 84 ref.

Descriptors: *Welding, *Welded joints, *Fatigue tests, Stress, Stress relieving, Heat treatment, *Bibliographies, Metals.
Identifiers: Weldments, Butt welds, *Welds, Electroslag welding, Filler welds, Arc welding, *Fatigue (Materials), Residual stress.

Literature on fatigue of steel weldments was reviewed and the effects on fatigue strength of testing conditions, weld geometry, weld metal soundness, residual stress, and microstructure of the weld metal and heat-affected zone were examined. Weld geometry was shown as the most important factor in determining fatigue properties of a weld. For a given weld geometry, the fatigue strength is determined by the severity of the stress concentration at the weld toe or, with the weld reinforcement removed, by the stress concentration at weld metal defects. Different welding processes influence fatigue strength by producing welds with different degrees of surface roughness and weld metal soundness. Residual stress caused by welding only affects fatigue strength for alternating loads. Under these conditions a moderate increase in fatigue strength is obtained by thermal stress relief. Larger increases in fatigue strength may be obtained by postweld treatments that produce compressive residual stresses, instead of the original tensile stresses, at the weld toe. The microstructures of the weld metal and heat-affected zone have only a minor effect upon the fatigue strength of welds and are usually masked by the much greater effects of weld geometry and weld defects. (USBR)
W73-10617

REINFORCED THERMOPLASTICS AND THERMOSETS FOR CORROSION CONTROL: STATE OF THE ART,
Monsanto Co., St. Louis, Mo.
T. L. Tolbert, and T. B. Lewis.
Materials Protection and Performance, Vol 11, No 4, p 19-24, April, 1972. 3 fig, 4 tab, 27 ref.

Descriptors: Materials, Materials testing, *Plastic pipes, *Plastics, Corrosion, Corrosion control, Pipes, *Physical properties, Strength of materials, Stainless steel, Asbestos, Cost analysis.
Identifiers: Fiberglass, *Thermoplastics.

The remarkable growth rate in use of FRP (Fiberglass Reinforced Plastic) for corrosion resistant service--15 to 25% per year during most of the 1960's--is testimony both to the need for improved corrosion resistant materials and to the corrosion engineer's increasing acceptance of reinforced plastics as materials of construction. Properties of this material which makes it advantageous in various applications are (1) superior corrosion resistance; (2) high strength and light weight; (3) low thermal and electrical conductivity; (4) ease of installation and little maintenance; (5) low installed cost. A high speed filament winding process coupled with an improved resin system has been used in fabrication of pipe to successfully bridge the cost barrier with steel; list prices for some sizes of vinyl-epoxy / glass pipe for oil field service have been reported to be below those of Schedule 40 (bare) steel. A comparison of FRP with other corrosion-resistant structural materials is given, along with properties of reinforcing agents used in FRP. (Smith-NWWA)
W73-10708

LESS TIME, FEWER HAZARDS WITH PELLETIZED ACID,
Universal Oil Products, St. Paul, Minn. Johnson Div.
D. C. Schafer.
Johnson Drillers' Journal, p 4-5, March-April 1971. 2 fig.

Descriptors: Wells, *Water wells, *Well screens, Chemicals, Chemical reactions, Municipal water, Pumps, Pumping, *Acids, Wellpoints.
Identifiers: *Rehabilitation (Wells), *Incrustation, Scaling, *Hydrochloric acid, Acid pellets.

For rehabilitation of incrusted water wells, acid pellets which dissolve readily once they fall to the bottom of a well save time and reduce the hazards of acid treatment. Use of these pellets makes it unnecessary to transport and handle dangerous liquid hydrochloric acid and eliminates the need for cumbersome pipe or hose arrangements to conduct liquid acid into the well screen. Advantages of pellitized acid over dry powdered acid are also given, mainly that less acid is needed in pellet form. The pump may be left in the well provided the space between pump and casing is large enough to allow the pellets to fall past the pump. Results are improved by agitation of the acid solution in the well; this can be done by starting and stopping the pump or by the use of a surge plunger. In order to force the solution out of the screen into the formation, it is recommended that a quantity of water equal to the volume in the screen be put into the well. After remaining for several hours or preferably overnight, the solution should be pumped to waste until the water is clean. Case histories of use in various municipal wells are given. (Smith-NWWA)
W73-10709

WELL LEVEL MEASUREMENT METHODS,
Maguire (Charles A.) and Associates, Boston, Mass.
R. H. Babcock.
Journal New England Water Works Association, Vol 85, No 1, p 1-9, March, 1971. 3 fig.

Descriptors: Wells, Water wells, *Water level recorders, *Water level fluctuations, Water levels, Groundwater, Groundwater resources, Well spacing, Well data, *Observation wells.
Identifiers: Water level records.

The measurement of well levels is essential for the evaluation of both proposed and existing ground water supplies. 2 1/2-inch observation wells are commonly used for this purpose, and can be located both adjacent to the well under test and at some distance to permit plotting and drawdown curve, as well as observing the influence of pumping upon the water table. The discussion is limited to those level measurement methods which are mechanical and, therefore, can be considered to have the highest degree of dependability for the conditions encountered. The most common technique, explained in detail, is the use of the bubble tube. Another arrangement, though not as well known as the common bubble tube, is the charged air bell method. The third class of devices for this service could be called hydropneumatic. Auxiliary devices for performing such functions as low water cutout or alarm, level or drawdown control, and level measurement transmission are described. (Campbell-NWWA)
W73-10710

UNDERGROUND CORROSION AND SALT INFILTRATION,
Connecticut Univ., Storrs, Dept. of Civil Engineering.
For primary bibliographic entry see Field 04C.
W73-10712

FIND, HALT CORROSION IN WELL CASING NOW FOR SAVINGS IN THE FUTURE,
Sun Oil Co., Tulsa, Okla.
E. J. Simmons.
Oil and Gas Journal, Vol 66, No 37, p 120-124, 127, September 9, 1968. 6 fig.

Descriptors: Corrosion, *Corrosion control, Logging (Recording), *Cathodic protection, *Well casing, Electrochemistry, Anodes, Bentonite, Resistivity, Pitting (Corrosion).
Identifiers: Well logging, *Caliper logging, Ground beds.

Costly workovers of wells due to leaks in the casing caused by external corrosion have prompted much investigative work and many individual as well as field-wide installations of cathodic protection systems. To obtain an idea of the extent of corrosion damage, the casing thickness logging tool is useful. Its signal undergoes a phase shift dependent on, among other things, the mass of metal surrounding the coils. This phase shift is recorded continuously on a chart at the surface as the tool is pulled up the hole, giving a continuous indication of metal mass surrounding the coils. Available as an auxiliary tool which can be run simultaneously with the casing-thickness tool is the electronic internal caliper log. Using both logs simultaneously, it is possible to ascertain whether pitting is external or internal. Curves of logs showing what collars, pits, holes, general corrosion, lower weight joints, and tapers would look like on a graph are given. An overview of the process of cathodic protection as applied to well casing is outlined. (Campbell-NWWA)
W73-10715

WELL LOGS: A BASIC DRILLING TOOL--6. USE DIAGENESIS TO SPOT FORMATION CHARACTERISTICS,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
W. R. Matthews.
Oil and Gas Journal, Vol 70, No 3, p 97-101, January 17, 1972. 15 fig, 23 ref.

Descriptors: *Logging (Recording), *Electrical well logging, Radioactive well logging, Pressure, *Geologic investigations, Geologic units, Salinity, Resistivity, Limestones, Oil industry, Sandstones, Drilling, Gamma rays, Drilling fluids, *Diagenesis.
Identifiers: Oil reservoirs, Nuclear well logging.

The use of principles of diagenesis, which includes compaction, cementation, recrystallization, and perhaps replacement, can show unconformities, faults, development of high pressure, communication between zones, and permeable sand with a large areal extent. An unconformity will be marked by an abrupt decrease in diagenetic values; faults are characterized by a very abrupt change from a decreasing diagenetic value to an increasing one; a marked gradual increase in diagenetic values characterizes the onset of high pressures; and zones in communication with other zones will show a very sharp increase in diagenetic values. Apparent diagenetic-stress factors can be obtained from gamma-ray logs; the procedure is outlined. Zones of lost circulation can sometimes be noted on induction logs--they are characterized by abnormally high resistivities. The makeup water is much fresher than the formation water in the normal compaction depths. (Smith-NWWA)
W73-10716

FUNDAMENTALS OF CATHODIC PROTECTION,
Mobil Research and Development Corp., Dallas, Tex.
F. E. Blount.
In: Proceedings, University of Oklahoma Corrosion Control Course, September, 1970, p 17/1 - 17/10. 7 fig, 2 tab, 3 ref.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, Resistance, Oxidation-reduction potential, Electrolytes, Anodes, Cathodes, Metals, Ions, Ion transport, Ionization.
Identifiers: *Polarization, *Electrical potential, Electromotive series, Stray currents.

Basic electrochemical principles necessary to the understanding of cathodic protection are discussed and explained; these principles are related to cathodic protection using and electrical analogy. The electron current flow concept (i. e., current is considered to be flowing from anode to cathode) is used throughout the discussion. The four components of a corrosion circuit are described, and the nature of the driving force in a corrosion cell is discussed covering such topics as

oxidation potentials, the zero potential, use of oxidation potentials to predict reactions, the electromotive series of metals, and the magnitude of potentials. Electrical analogies for cathodic protection mechanisms are given along with their limitations. The procedure of emf measurement between the structure to be protected and a reference electrode in order to determine whether the structure is being adequately protected is shown. (Campbell-NWWA)
W73-10784

HEAT FLOW AND PRECISION TEMPERATURE MEASUREMENTS IN BOREHOLES,
Virginia Polytechnic Inst., Blacksburg.
J. K. Costain, and P. M. Wright.
In: Society of Professional Well Log Analysts 10th Annual Logging Symposium, p J1-J21, 1969. 6 fig, 27 ref.

Descriptors: *Boreholes, *Heat flow, *Utah, Thermal radiation, Geophysics, Temperature, Instrumentation, *Data collections, Heat transfer, Conductivity, Rock properties.
Identifiers: Thermal energy, *Geothermal gradient, Thermal conductivity.

Heat flow measurements in boreholes might be a valuable supplementary exploration method in the future. Both the geothermal gradient and the rock thermal conductivity are necessary for a heat flow measurement. Comparison of the resistance of a platinum resistance probe with a primary standard resistance yields resistance measurements accurate in the field to about 0.003%. This value for a probe whose nominal ice-point resistance is about 1,000 ohms, is equivalent to an accuracy of plus or minus 0.01 degree C. However, other factors lower the absolute accuracy of temperature measurements to about plus or minus 0.05 degree C. The overall accuracy of heat flow measurements is probably 10% to 15%. A capstan hoist powered by a 2-hp electric motor was used to raise a double armored cable out of the borehole. (Smith-NWWA)
W73-10786

LOWEST COST-PER-FOOT IS AIM OF OWN CALCULATIONS,
D. Murphy.
Oil and Gas Journal, Vol 67, No 9, p 110-114, March 3, 1969. 8 fig, 2 ref.

Descriptors: Drilling, *Rotary drilling, *Optimization, Drilling equipment, Equations, Mathematical studies, Drilling fluids, Bearings, *Cost analysis.
Identifiers: *Drilling parameters, Rotary speed, Bit weight, Drill bits, Drill testing.

Three basic equations are given to determine optimum bit weights and rotary speeds. They are those for instantaneous drilling rate, instantaneous rate of tooth dulling, and the equation used to determine rotating hours before bearings fail. The four point drilling test is made during the half-life of the bit run so that the drilling rate will reflect an average of M and gamma (weight parameter and rotary speed exponent) over the entire run. A drilling test should be performed in the following order: (1) start the test with maximum weight so that if bit balling is going to be a problem, it will be apparent early and a lower weight can be used; (2) going from one point to the next requires a change in weight or rotary speed--not both; (3) the only time weight must be drilled off is in going from point 2 to point 3 in the four point test, and this is drilled off at maximum operating conditions; (4) the test can be run in the shortest time, and changes in total tooth wear will be a minimum. (Campbell-NWWA)
W73-10791

WELL STIMULATION--HOW ACIDS BEHAVE IN SOLUTION,
Marathon Oil Co., Tex.
For primary bibliographic entry see Field 08A.
W73-10792

SEISMOGRAPH AND RESISTIVITY USE IN SHALLOW GROUNDWATER SEARCH,
Layne-Northwest Co., Milwaukee, Wis.
J. P. O'Connor.
Journal of the American Water Works Association, Vol 62, No 7, p 433-434, July, 1970. 2 fig.

Descriptors: Groundwater, *Geologic investigations, Glacial aquifers, *Gravels, Shallow wells, Seismic waves, *Seismographs, Seismic properties, Surveys, Exploration, *Subsurface water availability, Resistivity, Zone of saturation.
Identifiers: Subsurface data, Lithology.

As the search for groundwater becomes more and more intensified, the need for fast, dependable aids to exploration becomes greater. A seismic instrument for use in ground water exploration utilizes a cathode ray tube to record seismic waves. The unit consists of the instrument itself, in 6 volt wet cell battery, a geophone, and a manually operated hammer or tamper used to create shock energy. Different methods of setting up the device, using different 'spreads' or lines of shock initiation are given. Test drilling many 'single spread' depth determinations to water table and bedrock have shown, in most instances, an accuracy of plus or minus 10 per cent. The seismograph provides accurate information on the thickness of saturated material underlying the areas of interest, information which is used to determine areas worthy of further geophysical exploration with the earth resistivity instrument. The seismograph also is useful in determining the type of bedrock, employing the principle that sound will travel at differing rates in materials of differing densities (i.e., differing lithologies). (Campbell-NWWA)
W73-10793

INVESTIGATION OF USE OF GEL MATERIAL FOR MINE SEALING,
Dravo Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W73-10880

8I. Fisheries Engineering

THE DISCOVERY OF BOTHRIOCEPHALUS GOWKONGENSIS YEH. IN THE BASIN OF KHARKOV REGION, (IN RUSSIAN),
Kharkov State Univ. (USSR).
N. N. Shevchenko, and L. K. Belinisova.
Vestn Zool. Vol 6, No 2, p 78-79, 1972. English summary.
Identifiers: *Bothriocephalus-Gowkongensis, *Cyprinus-Carpio, *Kharkov basin, Records, USSR.

In 1967 B. gowkongensis was found for the first time in fingerlings of Cyprinus carpio L. from the ponds of the Limanian fishery farm (the Kharkov region). Apparently it was brought into Lake Liman with acclimatized material from the basins of the Krasnodar region.–Copyright 1973, Biological Abstracts, Inc.
W73-10631

THE ELEMENTS OF ENERGY BALANCE IN GRASS CARP (CTENOPHARYNGODON IDELLA VAL.): II. FISH FED WITH ANIMAL FOOD,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
Z. Fischer.
Pol Arch Hydrobiol. Vol 19, No 1, p 65-82, 1972. Illus.
Identifiers: Animal food, *Carp (Grass), Ctenopharyngodon-Idella, Energy balance, *Fish food.

Comparison of energy budgets of grass carp fed with exlusively plant and exclusively animal food was made. Grass carp bred under laboratory conditions is omnivorous. Its growth rate is smaller when fed with exclusively plant food than with animal food. (See also W72-13815)--Copyright 1973, Biological Abstracts, Inc.
W73-10638

STUDIES ON THE CARP CULTURE IN RUNNING WATER POND: V. OXYGEN SUPPLY AND CONSUMPTION IN THE FISH POND AND ESTIMATION OF THE AMOUNT OF HARVESTABLE FISH IN A POND, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 02I.
W73-10815

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER AND RELATED LAND RESOURCES TRAINING NEEDS STUDY, COMPREHENSIVE PLANNING FOR WATER AND RELATED LAND RESOURCES IN ALABAMA,
Auburn Univ., Ala. Center for Urban and Regional Planning.
S. P. Snow.
Available from the National Technical Information Service as PB-213 562, $3.00 in paper copy, $0.95 in microfiche. Alabama Development Office, Montgomery, Report No. ALA-AU-X996-WRC-72-3, February, 1972. 86 p, 6 append. WRP-71-1.

Descriptors: *Water resources planning, *Training, Education, *Alabama, Land use, *Management.

It is difficult to obtain reliable and useful information concerning training needs for Alabama agencies involved in water resource and related land use programs. This situation is due in part to a general lack of understanding of what is involved in the over-all view of water resources and related land use planning, what role each agency plays in the process, and possibly a gap between what these agencies are doing and what needs to be done. In-house training is often dictated by the agency's purpose and function and closely linked with the degree of knowledge, training and background of its personnel. There is no one agency with knowledge of what is being offered on the continuing education level to meet training needs in Alabama. Additional formal courses and special programs especially at senior and graduate school levels are needed. A centralized training agency to initiate and co-ordinate an interagency and public education program with initial emphasis on pollution control, resource planning, water quality maintenance and improvement, and on water resource planning should be established. Appendices include an extensive catalog of available courses, sources of financial support and addresses of educational institutions. (Elfers-North Carolina)
W73-10695

9B. Education (In-House)

WATER AND RELATED LAND RESOURCES TRAINING NEEDS STUDY, COMPREHENSIVE PLANNING FOR WATER AND RELATED LAND RESOURCES IN ALABAMA,
Auburn Univ., Ala. Center for Urban and Regional Planning.
For primary bibliographic entry see Field 09A.
W73-10695

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10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

CONCEPTUAL SYSTEM DESIGN FOR AN ENVIRONMENTAL INFORMATION BASE FOR MANAGEMENT OF WATER AND RELATED RESOURCES BY STATES,
Banks (Harvey O.), Inc., Belmont, Calif.
O. Banks, and G. T. Orlob.
Available form the National Technical Information Service as PB-221 124, $4.85 in paper copy, $0.95 in microfiche. Completion Report, March 1973. 78 p, 2 fig, 4 append. OWRR X-114 (No. 3424) (1).

Descriptors: *State governments, *Management, *Decision-making, *Environment, *Natural resources, *Electronic Data Processing, *Data Storage and Retrieval, *Information Retrieval, Data collections, Systems design, Computers, Data Transmisson, Water resources, Land resources, Geographical Regions, Hydrologic Data.
Identifiers: Information Base, User-oriented, State level.

Research was undertaken to evaluate the present resource information management activities of the states as related to state functions, and to develop a concept for planning and designing a comprehensive state or regional information management system. Sound environmental resource development and management is increasingly a state responsibility, requiring availability of a comprehensive information base for evaluating alternatives. Incompatibility between state agency, and between state and federal agency data files, documented by questionnaires and field surveys, limits the accessibility of relevant information to resource managers. A state-level Environmental Resources Information Management System was conceptualized, supported by an Environmental Information Base incorporating the organized and systemized aggregation of resource information available from all resource agencies. Conceptual format and guidelines for the Information Base includes identification of Resource Subjects related to state agency functions, and a systemized methodology for classifying and indexing data types and parameters. Institutional arrangements for implementing the concepts were formulated. Tables include results from state surveys, and charts show the structure of the Information Management System and Information Base. The methodology would enable a state to develop and implement an Information Base that would provide compatible, accessible information on a timely basis for resource management by all agencies.
W73-10725

HYDROLOGY AS A SCIENCE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. J. Dvoracek, and D. D. Evans.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 19-29 (1972), 2 figs, 1 tab, 4 ref.

Descriptors: *Hydrology, *Education, *Systems analysis, Southwest U.S., Arid lands, Water balance, Hydrologic cycle, Oceanography, Meteorology, Geology, Biology, Glaciology, Geomorphology, Soils, Hydrologic properties, Water resources development, Water utilization, Water requirements, Surface waters, Groundwater, Water importing, Effluents, Water management (Applied), Water law, Economic impact, Legal aspects, Political aspects, Social aspects, Ecology, Environmental effects, Water users.

Experimental and historical development of the systematic study of water is briefly reviewed to prove hydrology a science. The Hydrology program at the University of Arizona is outlined, and details of the course 'water and the environment' are expounded. This introductory course is intended for non-scientific oriented students at this southwestern university. A reading list is provided for the class, and scientifically designed laboratory experiments are developed. The first semester includes discussion of world water inventory; occurrence of water; hydrologic cycle; interaction of oceanography, meteorology, geology, biology, glaciology, geomorphology and soils; properties of water (physical, biological, chemical), and resources development. The second semester discusses municipal, industrial and agricultural water requirements, surface, ground, imported and effluent water resources management; water law; economic, legal, political, and social water resource planning; ecological impact; patterns of use; and survival of man. Mathematical problems are reviewed along with ecological orientation of students. (See also W73-10818) (Popkin-Arizona)
W73-10820

WATER-TEMPERATURE DATA ACQUISITION ACTIVITIES IN THE UNITED STATES,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W73-10986

10C. Secondary Publication And Distribution

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME 1.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-10556

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-10557

FATIGUE OF STEEL WELDMENTS,
Jones and Laughlin Steel Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 08G.
W73-10617

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-10879

PESTICIDE-SEDIMENT-WATER INTERACTIONS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 05B.
W73-10892

BIBLIOGRAPHY ON THE ECOLOGY AND TAXONOMY OF MARINE ALGAE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05C.
W73-10949

10D. Specialized Information Center Services

DESIGN AND PILOT STUDY OF AN ARIZONA WATER INFORMATION SYSTEM,
Arizona Univ., Tucson. Office of Arid Lands Studies.
K. E. Foster, and J. D. Johnson.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 43-52, (1972). 2 fig, 9 ref.

Descriptors: *Hydrologic data, *Information retrieval, *Water, *Design data, *Arizona, Hydrologic systems, Groundwater, Rainfall-runoff relationships, Water levels, Water quality, Water utilization, Water demand, Arid lands, Data storage and retrieval.

Water information systems may have different demands, such as responding to queries about rainfall-runoff relationships, water level data, water quality data and water use. Data required for retrieval may need display, such as a hydrograph. Information systems are reviewed and results of specific water information agencies are reported. Agencies in Arizona are listed with their specific water information need. Development of a water activity file and water information system is outlined for Arizona as a pilot project. Linkage of units within the data system is shown, as is the information system's questionnaire to project leaders. Information currently in the system includes water quality from the State Department of Health for 450 wells in the Tucson Basin, and water level, storage, storage coefficient and transmissivity supplied by the Arizona Water Commission for the Tucson Basin and Avra Valley. Quality of data submitted to the system should be reflected in retrieval for better understanding of the data. This consideration is planned for the coming fiscal year. (See also W73-10818) (Popkin-Arizona)
W73-10822

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

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- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 18
SEPTEMBER 15, 1973

W73-11051 -- W73-11700

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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VOLUME 6, NUMBER 18
SEPTEMBER 15, 1973

W73-11051 — W73-11700

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

THE THERMAL CONDUCTIVITY OF PURE WATER AND STANDARD SEA WATER AS A FUNCTION OF PRESSURE AND TEMPERATURE: PART II--PURE WATER,
Naval Ship Research and Development Center, Bethesda, Md.
For primary bibliographic entry see Field 02K.
W73-11084

1B. Aqueous Solutions and Suspensions

A NEUTRON SPECTROSCOPIC STUDY OF THE DIFFUSIVE KINETICS AND INTERACTIONS OF WATER IN DENSE LAYER DESALINATION MEMBRANES,
Union Carbide Corp., Tuxedo, N.Y.
For primary bibliographic entry see Field 03A.
W73-11165

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa.
E. M. Arnett.
Available from the National Technical Information Service as PB-218 548, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 836, October 1972. 60 p, 22 fig, 32 tab. 14-30-2570.

Descriptors: *Solutes, *Enthalpy, *Entropy, Thermodynamics, Aqueous solutions, Salts.
Identifiers: *Nonelectrolytes, Salting-out, Nuclear magnetic resonance.

The interaction of nonelectrolytes with water and aqueous salt solutions has been investigated by several methods and several systems. Complete thermodynamics (delta G, delta H, delta S) of salting-out and salting-in have been investigated for a number of nonelectrolytes in aqueous salt solutions. The results constitute the only such systematic study of salting enthalpies and entropies. Conversely, the interaction of sodium chloride and some other salts with water-glycerol acetate binaries has been probed by thermodynamics and 23Na nmr. The relation of these results to interactions of cellulose acetate with salt water are considered. The behavior of the highly aqueous systems described here appears to be singular and is undoubtedly related to the unique ability of cool water to form extended three dimensional structured systems. (OSW)
W73-11166

02. WATER CYCLE

2A. General

PHYSICAL EROSION AND DENUDATION RATES IN CARTWRIGHT BASIN AND VICINITY, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-11140

HYDRAULICS OF SHALLOW FLOWS OVER STABLE ERODED SAND SURFACES DEFINED BY AREA SPECTRA,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
J. R., Burney, and L. F. Huggins.
Available from the National Technical Information Service as PB-221 347, $3.00 in paper copy, $0.95 in microfiche. Technical Report No. 36, 1973. 129 p, 38 fig, 3 tab, 92 ref, 7 append. OWRR-B-016-IND (1).

Descriptors: *Overland flow, *Rainfall-runoff relationships, *Rainfall simulators, *Hydraulic models, *Retention, Discharge, Runoff, Slopes, Small watersheds, Flood flow, Topography, Hydraulic similitude.
Identifiers: Area spectra, Micro-relief.

Development, testing, and evaluation are reported of instrumentation for recording the physical configuration of a natural, fallow land surface which includes both grain and form effects, and an attempt to relate the information to the hydraulic response of the surface.
W73-11192

CHEMICAL CYCLES WITH ENERGY CIRCUIT MODELS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
H. T. Odum.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 223-259, 1972. 27 fig, 1 tab, 35 ref. AEC Contract AT-(40-1)-4150.

Descriptors: *Model studies, *Geochemistry, *Sea water, *Ecosystems, Water chemistry, Mathematical models, Analog models, Chemical reactions, Ecology, Environmental effects.
Identifiers: *Energy circuit models.

An understanding of the large and complex systems of cycles of the earth, the seas, and man requires the simplification that comes with making models. Among the modeling and modular languages being developed for synthesis of macrosystems, an energy language may be used to consider the chemical cycles that sustain the sea. The language is a formalization of concepts of energy flow in which pathways represent either the energy flow driven by single forces or those driven by populations of forces. Each driven flow has opposing forces of frictional, inertial, or static nature, the latter derived from downstream storages of potential energy. Since the pathways represent all energy flows, and since theorems of the language allow all flows of matter and information to have their energy values at their points of action in the system, a common denominator is provided for all parts of all kinds of systems. The energy circuit language may be helpful in organizing understanding and hypotheses about which flows are linear, which are multiplicative actions, which are important, and which receive outside forcing energies. By diagramming subsystems and subcycles, it is possible to focus on various ideas about the origin, stability, and changes in the sea as related to man and other changing patterns. (See also W73-11367) (Knapp-USGS)
W73-11381

MATHEMATICAL METHODS IN THE THEORY AND PRACTICE OF MOUNTAIN STREAMFLOW COMPUTATION AND FORECASTING (MATEMATICHESKIYE METODY V TEORII I PRAKTIKE RASCHETOV I PROGNOZOV STOKA GORNYKH REK).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 04A.
W73-11406

INFORMATION ON ACTIVITIES OF THE COMMISSION ON SURFACE WATERS OF THE INTERNATIONAL ASSOCIATION OF SCIENTIFIC HYDROLOGY (IASH) (INFORMATSIYA O RABOTE KOMISSII POVERKHNOSTNYKH VOD MEZHDUNARODNOY ASSOTSIATSII NAUCHNOY GIDROLOGII (MANG)),
N. V. Nikol'skaya.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 1, p 124-125, January-February 1973.

Descriptors: *Conferences, *Technical societies, Air pollution, Water pollution, Water quality control, Mathematical models, Water balance, Snow, Ice, Mountains.
Identifiers: *USSR, *International Association of Scientific Hydrology (IASH).

The 15th General Assembly of the International Union of Geodesy and Geophysics was held in Moscow, July 30-August 14, 1971. Of the approximately 40 symposia arranged, several were under the direction of the International Association of Scientific Hydrology (IASH), now known as the International Association of Hydrological Sciences. These symposia included: water and air pollution (including 15 papers devoted to water-quality control and 20 papers to groundwater contamination); mathematical models in geophysics (19 papers); snow and ice in mountainous areas (57 papers); and water balance in semienclosed bodies of water (9 papers). The program of IASH activities for 1971-75 included symposia on statistical methods in hydrology (United States, 1972); hydrology of lakes (Finland, 1973); solution of hydrologic problems in the absence of sufficient data (Spain, 1973); artificial recharge of groundwater (United States, 1973); problems of snow mechanics (Switzerland, 1973); water balance (France, 1974); influence of man on water balance and the hydrologic regime (France, 1974); interaction of surface waters and groundwater (France, 1974); mathematical modeling of water-resources systems (German Democratic Republic, 1975); and distribution of snow in connection with surface roughness (France, 1975). (Josefson-USGS)
W73-11414

HYDROLOGY OF TRUCKEE MEADOWS, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 04B.
W73-11430

WATERSHED RESEARCH,
Texas Tech Univ., Lubbock.
H. A. Wright, S. C. Bunting, D. Windham, E. T. Van Nierop, and F. M. Churchill.
Noxious Brush and Weed Control Research Highlights-1972, Vol 3, p 16-17, 1972. 2 photo. OWRR C-3191 (No 3699) (1).

Descriptors: *Water yield, *Sediment yield, *Small watersheds, *Burning, Soil erosion, Runoff, Demonstration watersheds, Slopes, Vegetation effects, Rainfall-runoff relationships.

Water yield, sedimentation, and water quality were measured following a burn and were related to various degrees of cover and slope. During the study, 12 watersheds were selected and fenced. Four of the watersheds were on level areas (2.7 to 3.7%), four were on moderate slopes (7.8 to 20.1%), and four were on steep slopes (37.3 to 60.6%). One watershed of each degree of slope was burned without any prepared firelines. The moderate slope produced more runoff than the control only after a very intense storm of 2.18 inches/hr. The steep watershed (slope 52.8%) that had been burned produced from 887 to 34,765 gal/acre for storms that ranged in intensity from 0.10 to 2.18 inches/hr. Burning did not cause a significant release of sediment on the level areas, and only the most intense storm caused sediment to move on the moderate slope. However, a slow in-

tensity storm, an intense storm, and a moderately intense storm all caused significant soil movement on the steep watershed that had been burned. Degree of slope appears to account for most of the variation between watersheds. Burning increases calcium two to eight times and doubles the amount of magnesium. Turbidity of water was unchanged on the level areas, slightly increased on the moderate slopes, and increased as high as 2.9 ppm on the burned steep slope compared to 1.0 on the steep control. (Knapp-USGS)
W73-11534

INVESTIGATION OF INFRARED ANOMALIES IN THE LAC DES DEUX MONTAGNES AREA, QUEBEC,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 07B.
W73-11541

WATER RESOURCES INVENTORY OF CONNECTICUT: PART 6. UPPER HOUSATONIC RIVER BASIN,
Geological Survey, Hartford, Conn.
M. A. Cervione, Jr., D. L. Mazzaferro, and R. L. Melvin.
Connecticut Water Resources Bulletin No 21, 1972. 84 p, 50 fig, 4 plate, 27 tab, 108 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Connecticut, Precipitation (Atmospheric), Streamflow, Runoff, Water wells, Aquifers, Water yield, Chemical analysis, Sediment transport, Hydrologic data, Basic data collections, Maps, Curves.
Identifiers: *Upper Housatonic River basin (Conn).

The upper Housatonic River basin report area in Connecticut has an abundant supply of water of generally good quality, which is derived from precipitation. Annual precipitation has averaged about 46 inches over a 30-year period. Of this, approximately 22 inches of water is returned to the atmosphere each year by evaporation and transpiration. For the 30-year period 1931 through 1960, the annual runoff from precipitation averaged 24 inches (294 billion gallons). During the same period, inflows from Massachusetts and New York have averaged 220 and 64 billion gallons per year, respectively. A total average annual runoff of 578 billion gallons is therefore available. Stratified-drift aquifers are the only ones generally capable of yielding more than 100 gpm to individual wells. Drilled, screened wells tapping this unit yield from 17 to 1,400 gpm, with a median yield of 200 gpm. About 37% of the wells sampled yielded water with more than 200 mg/liter dissolved solids, and 50% yielded water with more than 120 mg/liter hardness. The quantity of suspended sediment transported by streams under natural conditions is negligible. (Woodard-USGS)
W73-11555

CLIMATE CHANGE AND THE INFLUENCE OF MAN'S ACTIVITIES ON THE GLOBAL ENVIRONMENT,
National Center for Atmospheric Research, Boulder, Colo.
W. W. Kellogg.
Available from NTIS Springfield, Va., 22151 as PB-213 676, Price $3.75 printed copy; $0.95 microfiche. Paper presented at Symposium on Energy, Resources and the Environment, July 11, 1972, Kyoto, Japan: Mitre Corporation Document M72-166, September 1972. 23 p, 7 fig.

Descriptors: *Climatology, *Climates, *Weather modification, *Environment, Sea ice, Carbon dioxide, Weather, Temperature, Heat balance, Albedo, Irrigation.
Identifiers: *Climatic change.

The history of changes in the earth's climate are traced from the earliest times to the present as recorded in the rocks and ice caps. Man's potential impact on the climate is discussed including the impact of carbon dioxide, particulate matters, 'albedo' changes, irrigation, and the direct release of heat. The results of man's activities are uncertain at this moment, but some preliminary computer calculations indicate that man can influence the climate of the earth, and that the direction of this influence in the decade to come must be that of a warming essentially in the Northern Hemisphere. The Arctic Ocean pack ice represents an unstable part of the ocean-atmosphere system in that a warming that would remove the pack ice would produce a major one-way transition. The impacts of such a transition would be very grave for some regions of the earth, but cannot be spelled out to become a disaster for mankind. (Knapp-USGS)
W73-11562

ELECTRICAL-ANALOG MODEL STUDY OF A HYDROLOGIC SYSTEM IN SOUTHEAST FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Appel.
Geological Survey Open-file report 73004, 1973. 51 p, 14 fig, 29 ref.

Descriptors: *Hydrologic systems, *Surface-groundwater relationships, *Aquifer characteristics, *Canals, *Analog models, *Florida, Hydrologic data, Correlation analysis, Aquifers, Water level fluctuations, Pumping, Groundwater recharge, Hydrogeology.

The hydrologic system of southeast Florida consists of the Biscayne aquifer, a system of levees and canals, and related water-control facilities. Because the canals cut into the highly permeable aquifer, the aquifer and canals form a hydraulically connected system. Thus, manipulation of water levels in a canal influences levels in the aquifer and conversely, pumping from the aquifer affects conditions in nearby canals. An electrical analog model of the hydrologic system was developed for estimating the transitory response of naturally occurring as well as man-induced stresses on the hydrologic system. Factors considered in constructing the analog model and analysis of results are described. A summary is presented of a model application to determine the quantity of water needed to maintain canals at specified stages in the southern part of Dade County during dry periods. The comparison between observed and model-derived responses to stress applied to the aquifer during the 1962 test period indicate that the analog model is feasible and useful in the analysis of problems. (Woodard-USGS)
W73-11570

2B. Precipitation

A CATALOG OF HYDROCLIMATOLOGICAL DATA FOR ALASKA'S COASTAL ZONE,
Alaska University, College. Inst. of Water Resources.
R. F. Carlson, and G. Weller.
Available from the National Technical Information Service as PB-221 375, $5.00 in paper copy, $0.95 in microfiche. Alaska Institute of Water Resources Report No 25 (Sea Grant Report 72-2), May 1972. 56 p. OWRR A-999-ALAS (2).

Descriptors: *Hydrologic data, *Climatic data, *Coasts, *Alaska, *Publications, Information retrieval, Documentation, Bibliographies, Water resources development, Land development, Conservation, Ecology, Environment, Precipitation (Atmospheric), Ice, Snow.
Identifiers: Hydroclimatological catalog (Alaska coasts).

A complete understanding of Alaska's coastal water zone is important to resource development, conservation, and environmental concerns. This data catalog contains a listing of 192 hydroclimatological data sources of Alaska's coastal zone. Each source listing has three parts: an information citation, the nature of the data available, and the location for which all or part of the data is available. The information citation is comprised of six parts: the agency which compiled the data, the title of the source, the authors, the publication date of the source, the dates for which the data are applicable, and the library accession number of the source, which is the main University library, unless another is indicated. (Woodard-USGS)
W73-11056

SPECTRA OF TURBULENT FLUCTUATIONS OVER OCEAN WAVES,
Naval Postgraduate School, Monterey, Calif.
G. S. Bingham.
Available from NTIS, Springfield, Va 22151 as AD-753 624, Price $3.00 printed copy; $0.95 microfiche. M Sc Thesis, September 1972. 62 p, 24 fig, 22 ref.

Descriptors: *Weather forecasting, *Air-water interfaces, *Oceans, *Ocean waves, *Waves (Water), Turbulence, Winds, Analytical techniques, Spectroscopy.
Identifiers: Spectral analysis, Wind-wave coupling, BOMEX, Sea-air interaction.

Several applied problems, especially long range atmospheric prediction, have created considerable interest in the contributory effects of the near surface boundary layer over the oceans. Significant progress occurred in 1969 with respect to observational studies as a result of the Barbados Oceanographic and Meteorological Experiment (BOMEX). Bomex took place in the Atlantic Ocean east-northeast of Barbados, West Indies. Spectral analyses were performed on turbulence data obtained over ocean waves during BOMEX. Results of seven selected periods were examined with respect to predictions in recent nonlinear and linear wind-wave coupling theories. Peaks in the velocity spectra occurred at the frequency of the wave spectra peaks (0.1 hz). At a frequency (0.26 hz) slightly higher than that of the wave spectrum peak the wind-wave phase relationship changes abruptly. This change occurred at a frequency where the wave phase speed was roughly two-thirds the mean wind speed at the level of measurement. At this same frequency the wind-wave correlation approached zero, and increased momentum transfer was observed. An examination of the amplitude ratio results confirmed the frequency of minimum wave induced disturbance to be at about 0.26 hz. (Woodard-USGS)
W73-11087

LARGE-SCALE AND LONG-TERM FLUCTUATIONS IN SOME ATMOSPHERIC AND OCEANIC VARIABLES,
National Weather Service, Silver Spring, Md. Extended Forecast Div.
J. Namias.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 27-48, 1972. 19 fig, 38 ref.

Descriptors: *Climatology, *Synoptic analysis, *Air-water interfaces, Weather, Climates, Ocean circulation, Air circulation, Air masses.
Identifiers: *Air-sea interactions.

Climatic fluctuations in the atmosphere of a month, season, or year are produced by circulation phenomena which, if persistent enough, may produce decadal, millenial and longer climatic aberrations. Recent short-period climatic fluctuations differ only in degree and not in kind from

great fluctuations of the past. Ocean variability is of a similar sort. When underlying sea-surface temperatures are studied in conjunction with these patterns, it is clear that the two media, air and sea, are coupled. The coupling takes place largely through heat exchange between sea and air and through water advection and mixing. For example, anomalous warm water temperatures in the cold months seem to encourage cyclone growth, while the cyclones frequently lessen evaporative heat losses by dampening the lower air with rain and by reducing back radiation through the formation of clouds. (See also W73-11367) (Knapp-USGS)
W73-11369

THE ROLE OF THE OCEANS AND BIOSPHERE IN THE CARBON DIOXIDE CYCLE,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
For primary bibliographic entry see Field 02K.
W73-11373

THE INFERENCE OF ATMOSPHERIC OZONE USING SATELLITE NADIR MEASUREMENTS IN THE 1042/CM BAND,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 07B.
W73-11400

A MODEL FOR RAIN EROSION OF HOMEGENEOUS MATERIALS,
Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08G.
W73-11560

HIGH-TEMPERATURE CONTACT NUCLEATION OF SUPERCOOLED WATER BY ORGANIC CHEMICALS AND APPENDIX OF COMPOUNDS TESTED,
Naval Weapons Center, China Lake, Calif. Michelson Labs.
For primary bibliographic entry see Field 03B.
W73-11699

2C. Snow, Ice, and Frost

A PRINCIPLES STUDY OF FACTORS AFFECTING THE HYDROLOGICAL BALANCE OF THE LEMON GLACIER SYSTEM AND ADJACENT SECTORS OF THE JUNEAU ICEFIELD, SOUTHEASTERN ALASKA, 1965-1969,
Michigan State Univ., East Lansing. Dept. of Geology.
M. M. Miller.
Available from the National Technical Information Service as PB-221 330, $6.00 in paper copy, $0.95 in microfiche. Completion Report Institute of Water Research, Michigan State University, Lansing, 1972. 294 p, 108 ref. OWRR B-002-MICH (4). 14-01-0001-1067.

Descriptors: *Glaciers, *Water balance, *Heat balance, Meteorological data, *Alaska.
Identifiers: Lemon Creek Glacier (Alas), Ptarmigan Glacier (Alas), Mass balance (Glaciers), *Juneau icefields.

The purpose is to consider those factors permitting establishment of the relationship between glacier mass balance, water balance, and heat balance and to include an overall assessment of the controlling meteorological parameters. The main analyses concern observations as they pertain to long-term trends affecting the regime of the Lemon and Ptarmigan Glaciers in southeastern Alaska. Initially it was hoped that the measurements could be made in greater detail than in any previous glacier investigations in southeast Alaska. To some extent this aim has been accomplished. Certainly more closely-spaced and more frequently checked observation sites were employed than in the study of the Lemon Glacier reported in 1964. Observations were also extended to include collection of data during periods of winter accumulation as well as in the summer ablation season. Considered in conjunction with a glacio-hydrological study on the Ptarmigan Glacier, and conducted in even more detail in the period 1966-1969, these data facilitate historical comparisons and add to the potential for forecasting future water budget trends. In a regional framework, this study provides information on a uniquely well-defined and completely self-contained glacier system ideally situated as a control location in the long-term glacio-climatic studies since 1946 on the Juneau Icefield, as well as for comparison with other coastal glacier systems originating in the complex of contiguous icefields in south and southeastern Alaska.
W73-11054

GREAT GLACIATIONS IN THE HISTORY OF THE EARTH (VELIKIYE OLEDENENIYA V ISTORII ZEMLI),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
B. M. Keller.
Sovetskaya Geologiya, No 9, p 26-35, September 1972. 1 fig, 54 ref.

Descriptors: *Glaciation, *Glaciers, *Glacial sediments, *Geologic time, Precambrian era, Paleozoic era, Quaternary period, Radioactive dating, Age.
Identifiers: USSR, *Geochronology, *Paleogeography, Tillites, Phanerozoic time, Riphean era, Ordovician period, Carboniferous period, Permian period.

Past great glaciations have been reliably established for Huronian deposits of the Canadian shield (tillites of the Gowganda formation dating back some 2 billion years in age), Upper Riphean deposits of Australia and South Africa, Wendian deposits of the Northern Hemisphere, Ordovician deposits of Africa, Upper Carboniferous and Lower Permian deposits of the Gondwana system, and anthropogenic (Quaternary) deposits. Great glaciations recur every 300 million years, and for the Phanerozoic generally coincide with the most important epochs of folding. The interval of time between two great glaciations corresponds to the duration of a cosmic year, this periodicity being particularly evident for the last two cosmic years. (Josefson-USGS)
W73-11095

INFLOW TO RIVERS IN THE PAMIRS (PITANIYE REK PAMIRA),
Moscow State Univ. (USSR). Chair of Hydrology.
S. Korimov.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 5, p 110-113, September-October 1972. 2 fig, 2 tab, 7 ref.

Descriptors: *Inflow, *Rivers, *Mountains, *Streamflow, *Runoff, Groundwater, Melt water, Snowmelt, Glaciers, Rainfall, Air temperature, Watersheds (Basins), Elevation, Hydrograph analysis, Estimating.
Identifiers: *USSR (Pamirs).

Estimates are made of the groundwater, snowmelt, and glacier contribution to annual streamflow for 15 rivers in the Pamirs. The groundwater contribution to streamflow varies between 20% and 53%. Glacier and snowmelt components of runoff are 13%-57% and 12%-50% of the total streamflow, respectively. The proportion of total annual runoff which occurs as rainfall is 0% to 3%. Studies are made of relations of snowmelt and glacier components of runoff to basin elevation and of April-September runoff of the Lyangar River to air temperature. (Josefson-USGS)
W73-11096

RATE OF RETREAT OF YUZHNO-CHUYA GLACIERS IN THE GORNO-ALTAY AUTONOMOUS OBLAST (O SKOROSTI OTSTUPANIY LEDNIKOV YUZHNO-CHUYSKIKH BELKOV GORNOGO ALTAYA),
Moscow State Univ. (USSR). Kafedra Obshchei Fizicheskoi Geografii i Paleogeografii.
A. A. Svitoch, V. S. Khorev, and O. B. Parunin.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 5, p 103-106, September-October 1972. 1 fig, 7 ref.

Descriptors: *Glaciers, Glaciation, Glacial drift, Radioactive dating, Age, Pleistocene epoch, Recent epoch.
Identifiers: *USSR (Gorno-Altay Autonomous Oblast), *Glacier retreat.

Radiocarbon dating of glacial formations in the Chegan-Uzun and Chegan River valleys (Gorno-Altay Autonomous Oblast) reveals that the age of glaciers range from 3,200 plus or minus 600 years to 25,300 plus or minus 600 years. The Sofiyskiy glacier, measuring 7 km in length and located at absolute elevations of 2,600-2,615 m, is the largest of all glaciers in upper reaches of the Chegan River. In 1898-1939, the average rate of retreat of the glacier was 24 m/yr, and in 1939-62 it was 18.3 m/yr. In 1963-71, the rate of glacier recession dropped to 10 m/yr. Comparison of the average shrinkage rate in the Late Pleistocene (about 1 m/yr) and Holocene (about 2.4 m/yr) with that for the last 100 years (about 17 m/yr) suggests a continued rise in the glacier's rate of decline. (Josefson-USGS)
W73-11097

UPPER PERMIAN GLACIOMARINE DEPOSITS IN THE KOLYMA RIVER BASIN (VERKHNEPERMSKIYE LEDOVO-MORSKIYE OTLOZHENIYA BASSEYNA ISTOKOV R. KOLYMY),
Severo-Vostochnoe Territorialnoe Geologicheskoe Upravlenie, Magadan (USSR).
For primary bibliographic entry see Field 02J.
W73-11103

SEASONAL EMERGENCE OF SOME HIGH ARCTIC CHIRONOMIDAE (DIPTERA),
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-11148

THE GROWTH RATE OF ICE CRYSTALS: THE PROPERTIES OF CARBON DIOXIDE HYDRATE A REVIEW OF PROPERTIES OF 51 GAS HYDRATES,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 03A.
W73-11156

MOISTURE TRANSFER AND FROST HEAVE IN LOAMS,
For primary bibliographic entry see Field 02G.
W73-11193

LEAD CONTAMINATION OF SNOW,
Ministry of the Environment, Ottawa (Ontario). Water Management.
For primary bibliographic entry see Field 05B.
W73-11275

RESEARCH AND THE PROBLEMS OF TWO SEAS,
For primary bibliographic entry see Field 02L.
W73-11350

ICE FORCES ON VERTICAL PILES,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08B.
W73-11538

DRAININGS OF ICE-DAMMED SUMMIT LAKE, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 02E.
W73-11547

CONTINUOUS OBSERVATIONS OF THE STRUCTURAL CHANGES IN DEFORMING POLYCRYSTALLINE ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
R. M. Sprenger.
Available from NTIS, Springfield, Va., 22151 as AD-755 336, Price $3.00 printed copy; $0.95 microfiche. Scientific Report, November 1972. 69 p, 17 fig, 1 tab, 25 ref, append. ONR Contract N00014-67-A-0103-0007.

Descriptors: *Ice, *Glaciology, *Cryology, *Crystallography, Investigations, Deformation, Temperature, Crystals, Ice cover, Stress, Melting, Mathematical studies, Photography, Analytical techniques.
Identifiers: *Ice deformation, Ice mechanics, Ice structure changes.

An apparatus was constructed to continuously observe structural changes accompanying the deformation of polycrystalline ice. Thin sections of natural glacier ice and arctic sea ice were subjected to compressive stresses of several bars at temperatures near the melting point. Polarized light was used to obtain photographic sequences of the deformation. The observations were designed so as not to interrupt the deformation, in contrast to previous studies. Grain boundary migration and basal glide were observed over a wide range of stresses and temperatures, while polygonization and various types of recrystallization were restricted to small stress-temperature regions. No voids or cracks were formed in the ice during these experiments. Regelation and intercrystalline sliding were not detected. Photographs and tracings of the deformation sequences and other quantitative data related to the observations are included. (Woodard-USGS)
W73-11556

TOWING ICEBERGS TO IRRIGATE ARID LANDS--MANNA OR MADNESS,
Cold Region Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 06F.
W73-11566

FORMATION AND FORECAST OF COMPONENTS IN THE HYDROLOGIC REGIMEN OF RIVERS (FORMIROVANIYE I PROGNOZY ELEMENTOV GIDROLOGICHESKOGO REZHIMA REK).
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-11688

CHARACTERISTICS OF ICE-JAM FORMATION ON THE SOVIET REACH OF THE DANUBE (OSOBENNOSTI ZATOROOBRAZOVANIYA NA SOVETSKOM UCHASTKE DUNAYA),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
N. F. Vagin, I. A. Kovernyy, and A. V. Shcherbak.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 57-68, Moscow, 1972. 4 fig, 2 tab, 12 ref.

Descriptors: *Ice, *Ice jams, *Rivers, Meteorology, Ice breakup, Water level fluctuations, Deltas, Winter, Forecasting.
Identifiers: *Danube River, Ice thickness.

The 171-km-long Soviet reach of the Danube between Reni and Vilkovo was investigated for development of ice-jam forecasting techniques. The ice regime in lower reaches of the Danube is highly unstable. The probability of occurrence of ice phenomena is 82% and the probability of establishment of complete ice cover is 54% (1931-69). Depending upon hydrometeorological conditions in winter, the length of period between the first appearance of ice and its complete removal varies in individual years between 1 and 95 days. Ice formation and growth and decay of ice cover are accompanied by ice jams which occur at narrow river bends, islands, and channel constrictions. The thickness of ice jams is determined by a number of hydrometeorological factors including intensity of autumnal and winter cooling, severity of winter conditions, river discharges, intensity of spring processes (ice breakup), and presence of fast or floating ice. Specific examples are given of ice jams on the reach in winters of 1946-47, 1953-54, and 1966-67. (See also W73-11688) (Josefson-USGS)
W73-11694

FORECASTING TIME OF FORMATION OF COMPLETE ICE COVER IN THE UPPER DNIEPER BASIN (O PROGNOZIROVANII SROKOV NASTUPLENIYA LEDOSTAVA V BASSEYNE VERKHNEGO DNEPRA),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
L. I. Solopenko.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 69-73, Moscow, 1972. 1 fig, 5 ref.

Descriptors: *Ice, *Ice cover, *Forecasting, Synoptic analysis, Air circulation, Autumn, Winter.
Identifiers: *Dnieper River.

Fall and winter ice phenomena on the Dnieper River at Rechitsa, Sozh River at Gomel', and Desna River at Chernigov were investigated in 1938-67 for quantitative descriptions of macrosynoptic processes in the antecedent period of ice formation, and for influence of these processes on time of formation of complete ice cover in the Upper Dnieper basin. A graph shows the relation of the time of formation of complete ice cover at these locations to the index of macrosynoptic processes in August and September. This quantitative index can be used to forecast the time of formation of complete ice cover on these reaches by October 1, a month in advance of its earliest occurrence in the region. (See also W73-11688) (Josefson-USGS)
W73-11695

2D. Evaporation and Transpiration

COMPARISON OF SIMULATED AND ACTUAL EVAPORATION FROM MAIZE AND SOIL IN A LYSIMETER,
Connecticut Agricultural Experiment Station, New Haven.
P. E. Waggoner, and N. C. Turner.
Agric Meteorol. Vol 10, No 1/2, p 113-123. 1972.
Identifiers: Diffusivity, *Evaporation, Humidity, Leaf, Lysimeter, *Maize-M, Net radiation, *Simulated evaporation, Simulators, Soils, Stomatal resistance, Temperature, Ventilation.

Evaporation from maize and soil in a pair of lysimeters in a maize crop, ventilation and net radiation above the crop canopy, temperature and humidity above and below the canopy, and leaf area and stomatal resistance in six strata of the canopy were observed during 12 1-hr periods. The measured evaporation was mimicked by an algebraic simulator of energy exchange in 6 canopy strata plus a 7th stratum occupied by bare stems and the soil surface when the observed stomatal resistance or a resistance that varied realistically with radiation was specified. If a constant stomatal resistance was specified, the simulation was inaccurate. Accurate simulation of evaporation from the soil required that diffusivity be decreased more rapidly within the lower canopy than the observed decrease in horizontal wind.--Copyright 1972, Biological Abstracts, Inc.
W73-11201

RADIATION, EVAPORATION AND THE MAINTENANCE OF TURBULENCE UNDER STABLE CONDITIONS IN THE LOWER ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
W. Brutsaert.
Boundary-Layer Meteorology, Vol 2, p 309-325, 1972. 51 ref. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-water interfaces, Estimating equations, Mass transfer, Water cooling, Diffusion, Atmosphere.
Identifiers: *Turbulent diffusion.

An expression is derived relating the critical flux Richardson number with the critical (gradient) Richardson number. In contrast to an earlier analysis by Townsend (1958), which is restricted to the atmosphere well outside the earth's boundary layer, the present treatment is intended specifically for turbulent flow in the lower atmosphere and it takes account of the effect of evaporation on the stability. The effect of radiation on the rate of destruction of the mean square of the temperature fluctuations is obtained by considering the radiative flux divergence in a stratified atmsophere and by using a simple functional relationship to represent empirical emissivity data. Evaporation and radiation increase the critical Richardson number by a sensible amount depending on the atmospheric conditions, mainly temperature, humidity and the gradients. There is no definite critical Richardson number but rather a range between 0.25, below which turbulence is very likely, and somewhat higher than 0.5, above which turbulence is improbable. The value of the critical Richardson number can be expressed in terms of evaporation, radiation and the ratio (sigma sub w/u*) which also appears not to have a definite critical value. Evaporation and radiation cause the ratio (sigma sub w/u*) to be larger than unity under neutral conditions. These results, based on the assumption of Reynold's analogy, KH ± KM, are consistent with the available experimental evidence. (EPA)
W73-11343

A POWER WIND LAW FOR TURBULENT TRANSFER COMPUTATIONS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
W. Brutsaert, and G-T Yeh.
Water Resources Research, Vol 6, No 5, p 1387-1391, October 1970. 2 tab, 40 ref. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-water interfaces, Estimating equations, Mass transfer, Water cooling, *Winds.
Identifiers: *Turbulent diffusion.

The parameters C and m of a power law for the wind profile u ± Cu* (z/z sub o)sup m, where u* is the friction velocity and z sub o is the roughness length of the surface, are determined as functions of the roughness and of the Monin-Obukhov stability length L through comparison with the log linear law for stable conditions and the interpolation law for unstable conditions. As expected, for neutral conditions the results show that m and C are approximately equal to 1/7 and 6, respectively. Parameter C increases slightly whereas m decreases with decreasing stability. (EPA)
W73-11344

COMPUTING EVAPOTRANSPIRATION BY GEOSTROPHIC DRAG CONCEPT,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
J. A. Mawdsley, and W. Brutsaert.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Proc Paper 9483 p 99-110, Jan 1973. 4 fig, 3 tab, 2 append. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-water interfaces, Estimating equations, Mass transfer, Water cooling, Diffusion, Atmosphere.
Identifiers: *Turbulent diffusion.

A procedure for computing regional evapotranspiration has been derived and tested. The assumptions underlying the model are essentially those used in the one dimensional mass transfer methods, but the shear stress is determined by means of (Tau sub o) ± rho (C sub g)squared (V sub go)squared in which rho ± the density of the air; C sub g ± the geostrophic drag coefficient as first proposed by Lettau; and V sub g ± the surface geostrophic wind. The main advantage of the method is that all data needed in the computation, i.e. the surface temperature, the pressure of the air, the specific humidity at two levels in the atmospheric boundary layer, and the surface geostrophic wind speed can be obtained from standard meteorological data. Generally, good agreement was obtained between mean monthly evapotranspiration computed for a number of stations and the corresponding evaporation data obtained from Class-A pans. (EPA)
W73-11345

UNIFIED FORMULATION OF WALL TURBULENCE,
Ebasco Services Inc., New York.
G-T Yeh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY12, p 2263-2271, December 1972. 3 fig, 2 append. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-water interfaces, Estimating equations, Mass transfer, Water cooling, Diffusion, *Turbulent flow.
Identifiers: *Turbulent diffusion.

By incorporating the effect of the viscosity into the roughness length model, allowing the total shear stress to vary linearly, and modifying the mixing length, the present theory gives good results for the entire flow region. The resulting equation covers the smooth wall as well as the rough wall flow. The equation also provides a single formula to describe the velocity profile in the three near-wall regions for a smooth surface. (EPA)
W73-11346

SENSITIVITY OF THE SOLUTION FOR HEAT FLUX OR EVAPORATION TO OFF-DIAGONAL TURBULENT DIFFUSIVITIES,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
G-T Yeh, and W. Brutsaert.
Water Resources Research, Vol 7, No 3, p 734-735, June 1971. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-water interfaces, Estimating equations, Mass transfer, Water cooling, Diffusion, Atmosphere.
Identifiers: *Turbulent diffusion.

The purpose is to study the effect of the terms containing the off-diagonal diffusivity components on the solution of the case of evaporation or turbulent heat transfer from a strip at ground level of width 2 (x sub o) extending laterally to infinity. It was concluded that the effect of the off-diagonal diffusivity may be considered negligible in the calculation of evaporation from large surfaces. (EPA)
W73-11347

PERTURBATION SOLUTION OF AN EQUATION OF ATMOSPHERIC TURBULENT DIFFUSION,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
G-T Yeh, and W. Brutsaert.
Journal of Geophysical Research, Vol 75, No 27, p 5173-5177, September 20, 1970. 1 fig, 6 ref. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-water interfaces, Estimating equations, Mass transfer, Water cooling, Diffusion, Atmosphere.
Identifiers: *Turbulent diffusion.

The regular perturbation method with a small parameter is applied to solve a turbulent transfer equation in the lower atmosphere without the lateral effect. From this solution the effect of longitudinal diffusion on evaporation is shown to be negative but negligible for evaporating surfaces larger than, say, 100 cm in the direction of the wind. (EPA)
W73-11348

A SOLUTION FOR SIMULTANEOUS TURBULENT HEAT AND VAPOR TRANSFER BETWEEN A WATER SURFACE AND THE ATMOSPHERE,
Cornell Univ., Ithaca, N.Y., School of Civil and Environmental Engineering.
G. T. Yeh, and W. Brutsaert.
Boundary - Layer Meteorology Vol 2, p 64-82, 1971. EPA 16130 DIP.

Descriptors: *Evaporation, *Heat transfer, *Air-Water interfaces, Estimating equations, Mass transfer, Water cooling, Diffusion, Atmosphere.
Identifiers: *Turbulent diffusion, Water vapor transfer.

Interaction between sensible heat and water vapor diffusion in the lower atmosphere leads to the necessity of solving two simultaneous turbulent diffusion equations. This solution is obtained by the construction of Green's function which when incorporated in the boundary conditions produces two integral equations. These are solved by transformation into two algebraic equations by means of the Laplace Transformation. The results show how for a simple steady-state case, sensible heat and water vapor transfer and also the water surface temperature depend on the meteorological conditions and the rate of change of energy content of the water body. Due to advection, the water surface temperature and the turbulent fluxes vary in the downwind direction. However, for practical calculations of the mean evaporation or heat transfer, the error introduced by the use of an average temperature is usually quite small and negligible. (EPA)
W73-11349

2E. Streamflow and Runoff

COASTAL DYNAMICS ALONG MUSTANG ISLAND, TEXAS,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 02L.
W73-11081

VIRGINIA SMALL STREAMS PROGRAM, PRELIMINARY FLOOD-FREQUENCY RELATIONS,
Geological Survey, Richmond, Va.
E. M. Miller.
Open-file report, 1971. 28 p, 13 fig, 9 ref, 1 append.

Descriptors: *Floods, *Flood frequency, *Small watersheds, *Virginia, *Frequency analysis, Regression analysis, Hydrologic data, Equations, Analytical techniques, Correlation analysis, Frequency curves, Streamflow, Flood forecasting.

Techniques are presented for estimating the probable magnitude and frequency of floods on small streams in Virginia. Also included is the history and current status of the cooperative program of small stream flood frequency investigations in Virginia. Regression equations are based on records collected on streams that are virtually unaffected by the influences of urbanization. Therefore, the relations should not be used for estimating flood magnitudes and frequencies for streams with appreciable amounts of urbanization in their basins. Graphical techniques were used to define flood-frequency curves for small stream sites with the 5 to 10 years of available record. Also for the 1964-70 period, frequency curves were drawn for 20 long term record gaging stations in the Atlantic Slope basins and 14 long term record gaging stations in the Ohio River basins. Frequency curves using annual peaks for the total period of record were available for all the long term stations. The regression equations are applicable for estimating the 2, 5, and 10-year flood magnitudes at small stream sites in Virginia. (Woodard-USGS)
W73-11090

FINITE ELEMENT SOLUTION FOR GENERAL FLUID MOTION,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 08B.
W73-11091

INFLOW TO RIVERS IN THE PAMIRS (PITANIYE REK PAMIRA),
Moscow State Univ. (USSR). Chair of Hydrology.
For primary bibliographic entry see Field 02C.
W73-11096

MINIMUM FLOW IN THE IBERIAN PENINSULA (MINIMAL'NYY STOK REK PIRENEYSKOGO POLUOSTROVA),
Moscow State Univ. (USSR). Chair of Hydrology.
K. S. Sivasami.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 5, p 81-86, September-October 1972. 3 fig, 2 tab, 8 ref.

Descriptors: *Low flow, *Low flow freqency, *Average flow, Rivers, River basins, Drainage area, Water balance, Variability, Mass curves, Maps.
Identifiers: USSR, *Iberian Peninsula, Spain, Portugal.

Characteristics of minimum flow in the Iberian Peninsula were based on observations of runoff at 294 hydrologic stations located principally on unregulated river reaches in Spain. Twenty-six percent of the stations had a period of record of more than 30 years, 44% had a period of record of more than 20 years, and 30% had a period of record of less than 20 years. Seventy-three percent of the stations had a drainage area of less than 1,000 sq km, 21% had a drainage area between 1,000 and 5,000 sq km, and only 6% had a drainage area of more than 5,000 sq km. Average monthly minimum flow from the peninsula is 29.00 cu km, of which 19.84 cu km (68.4%) is flow into the Atlantic Ocean and 9.16 cu km (31.6%) is flow into the Mediterranean Sea. The average rate of minimum monthly flow for the entire peninsula is 1.60 liter/sec/sq km. For the Atlantic slope it is 1.57 liter/sec/sq km, and for the Mediterranean slope it is 1.6 liter/sec/sq km. The coefficients of variation of average monthly mimimum flow vary widely. (Josefson-USGS)
W73-11098

DISTRIBUTION OF AVERAGE TURBIDITY OF RIVERS IN THE ARMENIAN SSR (RASPREDELENIYE SREDNEY MUTNOSTI REK PO TERRITORII ARMYANSKOY SSR),
Moscow State Univ. (USSR). Chair of Hydrology.
S. G. Musoyan.

Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 5, p 77-80, September-October 1972. 1 fig, 2 tab, 3 ref.

Descriptors: *Turbidity, Average, *Rivers, *River basins, Lake basins, Drainage area, Discharge (Water), Rocks, Maps.
Identifiers: *USSR (Armenian SSR).

Average turbidity of rivers in the Armenian SSR is based on data for 22 rivers in the Kura and Araks River basins, and Lake Sevan basin. Maximum average turbidity occurs in the Kura River basin (270 g/cu m) and minimum average turbidity, in the Lake Sevan basin (60 g/cu m). For rivers in the Araks basin, turbidity averages 188 g/cu m. The average turbidity of all rivers in the Republic is 173 g/cu m. A map shows the division of the Republic into 7 zones, where turbidity values range from less than 100 g/cu m to more than 600 g/cu m. (Josefson-USGS)
W73-11099

INVESTIGATION OF SEASONAL VARIABILITY OF RUNOFF ON RIVERS IN THE ALTAY AND SAYAN MOUNTAIN SYSTEMS (ISSLEDOVANIYE VNUTRIGODOVOY NERAVNOMERNOSTI STOKA REK ALTAYA I SAYAN),
Moscow State Univ. (USSR). Chair of Hydrology.
V. D. Bykov, A. N. Vazhnov, and I. S. Fedorova.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 5, p 23-31, September-October 1972. 3 fig, 2 tab, 5 ref.

Descriptors: *Runoff, *Rivers, *Mountains, *Variability, *Seasonal, Annual, Precipitation (Atmospheric), Floods, Melt water, Snowmelt, Glaciers, Elevation, River basins, Mass curves.
Identifiers: *USSR (Altay Mountains), *USSR (Sayan Mountains).

Changes in seasonal runoff with basin elevation and the relation of seasonal runoff to annual runoff were investigated for upper reaches of the Ob' and Yenisey Rivers and for reaches along the left bank of the Angara River. The relations obtained can be used to compute runoff characteristics for rivers in the Altay and Sayan mountain systems. (Josefson-USGS)
W73-11101

FLOOD OF JUNE 9-10, 1972, AT RAPID CITY, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-11105

HYDROGRAPHIC STUDY OF THE SHELF AND SLOPE WATERS OF NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. J. Bowman, and P. K. Weyl.
Available from NTIS AD-748 012, Springfield, Va. 22151, Price $3.00 printed copy; 95 cents microfiche. Technical Report Series No 16, August 1972. 46 p, 37 fig, 11 ref. ONR Contract No N00014-68-C-0298.

Descriptors: *Oceanography, *Atlantic Ocean, *Continental shelf, *Continental slope, New York, Water properties, Water temperature, Salinity, Ocean currents, Data collections, Sampling, Measurement, Boats, Hydrologic data, Ocean circulation.
Identifiers: *New York Bight, Gulf Stream, Temperature-salinity front.

Data are summarized from three oceanographic cruises made during 1970 and 1971 to investigate the physical characteristics of the shelf and slope waters of New York Bight. There was a sharp temperature-salinity front over the continental slope during the months of June 1970 and April 1971. Associated with this front was a subsurface warm tongue delineated by a temperature maximum which intersected the edge of the shelf at a depth of about 150 meters. Data obtained in August 1971 showed no evidence of any temperature front over the slope but suggested the existence of an irregular salinity gradient. Three factors appear to be important in the dynamics of the formation and dispersion of the subsurface warm tongue over the continental slope. These are the existence of the temperature-salinity front and the associated convergence zone, the meanderings of the Gulf Stream and the creation of warm eddies, and the intrusion of Labrador water into the Bight. (Woodard-USGS)
W73-11110

DISAGGREGATION PROCESSES IN STOCHASTIC HYDROLOGY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. D. Valencia, and J. C. Schaake, Jr.
Water Resources Research, Vol 9, No 3, p 580-585, June 1973. 11 ref.

Descriptors: *Hydrology, *Time series analysis, *Stochastic processes, Data collections, Seasonal, Streamflow, Runoff, Simulation analysis, Mathematical models, Systems analysis.
Identifiers: *Disaggregation processes, Covariance, Variance, Parameter estimation, Matalas' multivariate model, Autoregressive models, Functional noise approximation, Sequential data generation.

The need to preserve both long-term and short-term variance and covariance properties of hydrologic processes has led to the development of numerous stochastic models during the past few years. Among these are the models first proposed by Mandelbrot and Wallis for preserving the Hurst phenomenon. All these models use sequential generation schemes, and some require the process to be stationary without seasonal variations. A technique is presented for generating multiple hydrologic time series in which both the short-term and long-term variance and covariance properties, including seasonal variations, are preserved. The technique combines any of the presently used models for sequentially generating annual events with a disaggregation model for generating seasonal, monthly, weekly, or daily events within a year. The model presented herein does not necessarily generate data sequentially, although the autoregressive models of any order are special cases of this model. If an annual series has been generated by this or any other model, this model may be used to generate a parallel series of seasonal events from the given series of annual events. The model has been used for rainfall generation in Puerto Rico, streamflow generation in Argentina and the United States, and for generation of hourly water demands in the Boston water distribution system. (Bell-Cornell)
W73-11141

HYDRAULICS OF SHALLOW FLOWS OVER STABLE ERODED SAND SURFACES DEFINED BY AREA SPECTRA,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W73-11192

A STUDY OF THE FLINT RIVER, MICHIGAN, AS IT RELATES TO LOW-FLOW AUGMENTATION,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 05G.
W73-11207

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS, METROPOLITAN AREA, 1971,
Geological Survey, Fort Worth, Tex.
For primary bibliographic entry see Field 04C.
W73-11215

PROBABILISTIC SHORT-TERM RIVER YIELD FORECASTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-11366

PHYSICAL MODELS OF LARGE SCALE OCEAN CIRCULATION,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
G. Veronis.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 19-25, 1972. 2 fig, 3 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Water chemistry, Oceanography, Winds, Tracers, Stratification, Thermal stratification, Topography.

Large scale ocean circulation is generated by wind stresses and by heat fluxes and salt fluxes (associated with evaporation and precipitation) at the surface. Flow below the wind-driven circulation is attributed to differences generated by differential solar insolation between equator and pole. The result is a poleward flow everywhere in the deep ocean. Boundary layer flow compensates for the unidirectional interior flow. This boundary current is on the western side of each basin. Western oceanic boundary regions (both abyssal and coastal) as well as regions of substantial topographic relief should be selected as sites for dense sampling. These regions are in contact with the deep water sources for most of the world's oceans and should provide the geochemist with the freshest concentrations of various tracers for each ocean. (See also W73-11367) (Knapp-USGS)
W73-11368

THE FRESHWATER STREAM, A COMPLEX ECOSYSTEM,
Louisville Univ., Ky. Dept. of Biology.
For primary bibliographic entry see Field 06G.
W73-11389

WATER RECORDS OF THE U.S. VIRGIN ISLANDS, 1962-69,
Geological Survey, Washington, D.C.
T. M. Robison.
Data report, 1973. 163 p, 4 fig, 2 ref.

Descriptors: *Streamflow, *Groundwater, *Water quality, *Virgin Islands, *Basic data collections, Water level fluctuations, Runoff, Gaging stations, Discharge measurement, Flow rates, Aquifers, Chemical analysis, Water analysis, Water chemistry, Water resources.

The surface water, quality of water, and groundwater records of the Virgin Islands from 1962 through 1969 are presented. The location of stations are shown on individual island maps. Each island map is followed by the tabulation of water records for that island. The records were collected by the Caribbean District of the Water Resources Division, U.S. Geological Survey, in financial cooperation with the Government of the Virgin Islands of the United States and the National Park Service. The base data collected at streamflow stations consist of records of stage and measurements of discharge. In addition, observations of factors affecting the stage-discharge relation, weather records, and other information are used to

supplement base data. A descriptive statement is given for each quality-of-water data station, usually combined with the description for a streamflow station or observation-well station. This statement includes the location of the sampling station, drainage area, period of record, records available, and selected extremes. Groundwater level data were obtained from a network of observation wells located at significant places in important aquifers. A well description precedes each data table. Included are the type, geology and location of the well, the extremes of water level, and the period of record. (Woodard-USGS)
W73-11396

EFFECTS OF URBANIZATION ON FLOODS IN THE HOUSTON, TEXAS, METROPOLITAN AREA,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04C.
W73-11402

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1972,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
R. H. Nakahara.
Basic Data Release--Progress Report No 15, March 1973. 207 p, 5 fig, 1 tab.

Descriptors: *Floods, *Peak discharge, *Streamflow, *Hawaii, *Basic data collections, Hydrologic data, Gaging stations, Stream gages, Crest-stage gages, Flood frequency, Flood damage, Flood control, Annual peak discharge, Reviews.

This progress report contains records of annual peak stage and discharge at gaging stations through September 30, 1972, and a compilation of peak discharges at miscellaneous sites. At the close of the water year, flood data were being collected from 64 regular gaging stations and 93 crest-stage gaging stations on Kauai, Oahu, Molokai, Maui, and Hawaii. Annual flood peaks were recorded somewhere in the state during each month of the year except May, September, and October. Also included are annual maximum discharges, by water years, for each station. Floods, mainly because of the high frequency of intense rainfall, are common in Hawaii. Flood damages to crops, homes, highways, and other facilities, and pollution of bays and estuaries from storm runoff and sediment discharge occur nearly every year. Knowledge of the magnitude and probable frequency of floods is necessary for the proper design of control and conveyance structures, pollution abatement facilities, and planning for use of flood plains. (Woodard-USGS)
W73-11404

PROBLEM OF THE INFLUENCE OF SHAPE OF CHANNEL CROSS SECTION ON VELOCITY DISTRIBUTION IN A UNIFORM TURBULENT FLOW (K VOPROSU O VLIYANII FORMY SECHENIYA RUSLA NA RASPREDELENIYE SKOROSTEY V RAVNOMERNOM TURBULENTNOM POTOKE),
Dnepropetrovski Khimiko-Tekhnologicheskii Institut, (USSR).
For primary bibliographic entry see Field 08B.
W73-11408

A MATHEMATICAL MODEL TO AID MANAGEMENT OF OUTFLOW FROM THE OKAVANGO SWAMP, BOTSWANA,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 06A.
W73-11543

DRAININGS OF ICE-DAMMED SUMMIT LAKE, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
R. Gilbert.
Canada Department of the Environment, Inland Waters Directorate Scientific Series No 20, 1972. 17 p, 8 fig, 14 ref, 3 append.

Descriptors: *Lakes, *Glaciers, *Dam failure, *Melting, Canada, Ice breakup, Leakage, Water balance, Water temperature.
Identifiers: *Ice-dammed lakes, *Summit Lake (B C).

Drainings of ice-dammed Summit Lake, B. C., occurred in 1961, 1965, 1967, 1968, and 1970. In 1968, tests were carried out on a water balance model for the lake equating inflow and precipitation to volume change in the filling lake, determination of overflow when full, and detection of water leakage under or through the ice dam. The water balance study indicated that if one half of the area of the damming glacier contributed inflow, a leak of 3 to 5 cu m per sec existed in August 1968, three months before the fourth draining. Lake water temperatures were recorded from July to September 1968 and in July 1969. Warmest water (2.6 deg C) was found farthest from the dam in early summer. Temperature decreased at all locations from mid-July. The existence of a small tunnel associated with a continuous leak, and enlarging of this tunnel by melt provides a rational explanation for the catastrophic drainings. Heat generated by potential energy loss during draining is sufficient to account for tunnel enlargement. For the drainings of 1965, 1967, 1968, and 1970, lake water temperatures of 0.2 deg C, 0.9 deg C, 0.15 deg C, and 1.1 deg C, respectively, were required to account completely for tunnel enlargement in the terminal stages. (Knapp-USGS)
W73-11547

BIOLOGICAL EFFECTS OF FLUCTUATING WATER LEVELS IN THE SNAKE RIVER, GRAND TETON NATIONAL PARK, WYOMING,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
R. L. Kroger.
The American Midland Naturalist, Vol 89, No 2, p 478-481, April 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Flow rates, *Water level fluctuations, *Irrigation effects, *Stoneflies, *Mayflies, *Caddisflies, *Diptera, *Mites, *Sculpins, Aquatic populations, Sampling, Invertebrates, Aquatic insects, Rivers, Benthic fauna, Wyoming, Freshwater fish, Water beetles, Midges.
Identifiers: *Snake River, Beetles, Macroinvertebrates, Alloperla, Isoperla, Ephemerella inermis, Baetis tricaudatus, Paraleptophlebia, Rithrogena hageni, Hydropsyche, Hydroptila, Glossosoma montana, Oecetis, Simulium, Atherix variegata, Metachela, Acarina, Chironomids.

Water levels fluctuate widely in the Snake River, Wyoming because of the demands for irrigation waters by Idaho potato growers. This study was conducted to determine whether these fluctuations had any significant effect on the biota in the river. Five samples of exposed streambed (0.092 sq m by 0.1 m deep) were collected after flow was reduced from 2.8 to 0.3 cu m per sec. in less than 5 minutes, and aquatic invertebrates separated. A total of 15,490 invertebrates weighing 13.6 g were identified. Dipterans, caddisflies, mayflies, and stoneflies, in that order, were most abundant. A drift net and a migration trap placed below the riffles before drawdown showed that all of the macroinvertebrates in the exposed areas were left stranded. It was estimated that in a 3-km stretch of the river over 3 billion invertebrates were destroyed. In addition, 55 sculpins were left stranded in three 0.84 sq meter areas. The results indicate that fluctuating water levels may be more harmful to the production of sport fish than the actual destruction of prey organisms since algae and higher aquatic plants, which provide necessary habitat for these organisms, are also destroyed. Extreme low water levels may be more detrimental to productivity than fluctuating flows since other studies have shown that many organisms cannot adapt to alternating lotic and lentic habitats. It is concluded that flow conditions will have to be altered to improve the productivity of this area of the Snake River. (Little-Battelle)
W73-11594

CITY OF ALBUQUERQUE SANDIA FOOTHILLS DRAINAGE.
O'Brien (Ken) and Associates, Albuquerque, N. Mex.
For primary bibliographic entry see Field 04A.
W73-11668

SUPPLEMENT TO CITY OF ALBUQUERQUE SANDIA FOOTHILLS DRAINAGE STUDY.
O'Brien (Ken) and Associates, Albuquerque, N. Mex.
For primary bibliographic entry see Field 04A.
W73-11669

STUDY FOR IMPROVEMENT OF MONTE SANO BAYOU FROM AIRLINE HIGHWAY TO MISSISSIPPI RIVER EAST BRANCH ROUGE PARISH, LOUISIANA.
Brown and Butler, Baton Rouge, La.
For primary bibliographic entry see Field 08A.
W73-11682

FORMATION AND FORECAST OF COMPONENTS IN THE HYDROLOGIC REGIMEN OF RIVERS (FORMIROVANIYE I PROGNOZY ELEMENTOV GIDROLOGICHESKOGO REZHIMA REK).
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, L. T. Pashova, editor, Moscow, 1972. 88 p.

Descriptors: *Rivers, *Regimen, *Forecasting, Flood routing, Floods, Channels, Reservoirs, Hydrographs, Streamflow, Runoff, Discharge (Water), Inflow, Water loss, Melt water, Snowmelt, Ice jams, Ice cover, Meteorological data, Digital computers, Optimization.
Identifiers: *Ukraine, Travel time, Nomograms.

Streamflow forecasting, flood-wave movement, and ice regime of rivers are investigated in this collection of 8 papers. Dynamics of snowmelt losses during a spring flood are described, and methods are developed for preparing a short-term forecast of spring-flood hydrographs based on channel inflow and for forecasting quarterly inflow of water to Dnieper River reservoirs during the cold period of the year. To compute travel time on tributary reaches of rivers and propagation of flood waves along the cascade of Dnieper River reservoirs, the M-220 digital computer was used. Formation of ice jams on the Soviet reach of the Danube is discussed together with the possibility of forecasting the time of formation of complete ice cover in the Upper Dnieper basin based on quantitative descriptions of macrosynoptic processes. (See W73-11689 thru W73-11695) (Josefson-USGS)
W73-11688

PRECOMPUTATION OF A SPRING-FLOOD HYDROGRAPH BASED ON HYDROMETEOROLOGICAL DATA (PREDVYCHISLENIYE GIDROGRAFA VESENNEGO POLOVOD'YA PO GIDROMETEOROLOGICHESKIM DANNYM),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).

Ye. I. Kochelaba.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 3-15, Moscow 1972. 3 fig, 4 tab, 20 ref.

Descriptors: *Flood forecasting, *Hydrographs, *Hydrograph analysis, *Meteorological data, Flood routing, Channels, Inflow, Discharge (Water), Runoff, Rainfall, Time lag, Snowmelt, Snow, Curves.
Identifiers: Travel time.

Short-term forecasts of snowmelt runoff were based on lag time curves for the Teterev River at Makalevichi (drainage area--7,890 sq km; length--229 km), Uzh River at Polesskoye (drainage area--5,690 sq km; length--168 km), and Sozh River at Gomel' (drainage area--38,900 sq km; length--543 km). Channel inflow for the Uzh and Teterev Rivers was calculated from average snowmelt intensity for the basin, while channel inflow for the Sozh River was calculated from snowmelt intensity in the zone of maximum discharge with allowance for regulation of runoff by snow cover and basin surface, dynamics of snowmelt losses, and rainfall during the snowmelt period. To determine beginning dates of snowmelt and to define parameters of lag time curves, the runoff of small basins was used. Channel inflow was calculated from data of a hydrometeorological network. (See also W73-11688) (Josefson-USGS)
W73-11689

INVESTIGATION OF THE DYNAMICS AND CALCULATION OF THE LOSSES OF SPRING RUNOFF IN A SMALL RIVER BASIN (ISSLEDOVANIYE DINAMIKI I RASCHET POTER' VESENNEGO STOKA V MALOM RECHNOM BASSEYNE),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
V. A. Romanenko, and L. K. Grigor'yeva.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 16-26, Moscow, 1972. 2 fig, 13 ref.

Descriptors: *Water loss, *Snowmelt, *Runoff, *Spring, *Small watersheds, Snow, Snow cover, Water equivalent, Water yield, Precipitation (Atmospheric), Soil moisture, Snow surveys, Probability, Curves, Equations.
Identifiers: *Ukraine, Nomograms.

A method is proposed for calculating snowmelt losses during a flood by considering the dynamics of snomelt losses in time and the regulating capacity of snow cover. Data used for computations in the 42-sq-km Golovesnya River basin include snowmelt intensity, precipitation, area of water yield, and snowmelt runoff conditions. Snowmelt was claculated from the temperature coefficient of melting and from the Shulyakovskiy nomogram, and water yield was determined at different values of the water-retaining capacity of snow. Runoff conditions were determined from the relation of soil moisture to depth of soil freezing. Methods are presented for defining curves of probability for the water equivalent of snow, and an evaluation is made of the computed snowmelt losses. (See also W73-11688) (Josefson-USGS)
W73-11690

EXPERIMENT IN THE USE OF DIGITAL COMPUTERS TO DETERMINE TRAVELTIME ON A TRIBUTARY REACH OF A RIVER (OPYT ISPOL'ZOVANIYA ETSVM PRI OPREDELENII VREMENI DOBEGANIYA NA PRITOCHNOM UCHASTKE REKI),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
M. N. Sosedko.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 44-50, Moscow, 1972. 3 fig, 3 tab, 7 ref.

Descriptors: *Discharge (Water), *Tributaries, *Rivers, *Digital computers, Computer programs, Floods, Flood waves, Hydrographs, Gaging stations, Equations.
Identifiers: *Dniester River, *Travel time.

The M-220 digital computer was used to compute traveltime based on an equation of corresponding discharges on a reach of the Dniester River between the Zhuravno and Galich gaging stations. A brief analysis is given of results of computation of traveltime for discharges of different mangitudes. (See also W73-11688) (Josefson-USGS)
W73-11692

USE OF DIGITAL COMPUTERS TO COMPUTE PROPAGATION OF FLOOD WAVES ALONG THE CASCADE OF RESERVOIRS ON THE DNIEPER RIVER (PRIMENENIYE ETSVM DLYA RASCHETA RASPROSTRANENIYA VOLN POLOVODIY PO KASKADU GIDROUZLOV NA DNEPRE),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
L. B. Byshovets, and R. I. Margulis.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 51-56, Moscow, 1972. 1 fig, 3 ref.

Descriptors: *Flood waves, *Flood routing, *Reservoirs, *Rivers, *Digital computers, Computer programs, Inflow, Discharge (Water), Water levels, Gaging stations, Equations.
Identifiers: *Ukraine, *Dneiper River.

The M-220 digital computer was used to compute propagation of flood waves along the cascade of reservoirs on the Dnieper River from upstream gaging stations (Mozyr' on the Pripyat' River, Rechitsa on the Dnieper River, Gomel' on the Sozh River, and Chernigov on the Desna River) to Kakhovka. The computer program consists of a subprogram of flood routing in river channels; a subprogram of flood routing in the reservoir; calculation of water inflow and outflow for the Kiev Reservoir; flood routing of the Desna River from Chernigov to the river mouth and of the Dnieper River from Kiev to Kanev; and calculation of inflow and outflow for the Kremenchug, Dnieper im. V.I. Lenina, and Kakhovka Reservoirs. The tabular printout provides data on inflow, water levels, and discharge of the Kiev Reservoir; water discharges at the mouth of the Desna near Kiev and Kanev; and inflow, water levels, and discharge of the Kremenchug, Dneprodzerzhinsk, Dnieper im. V.I. Lenina, and Kakhovka Reservoirs. (See also W73-11688) (Josefson-USGS)
W73-11693

2F. Groundwater

GROUND WATER RECHARGE THROUGH PITS AND WELLS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 04B.
W73-11053

GROUNDWATER DATA IN THE CORVALLIS--ALBANDY AREA, CENTRAL WILLIAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 04B.
W73-11093

GROUNDWATER REGIME IN THE ZONE OF INFLUENCE OF PUMPING (REZHIM GRUNTOVYKH VOD V ZONE VLIYANIYA VERTIKAL'NOGO DRENAZHA),
Bukharskaya Selskokhozyaistvennaya Opytnaya Stantsiya (USSR).
For primary bibliographic entry see Field 04B.
W73-11094

GROUND WATER IN FINNEY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-11106

GROUNDWATER LEVELS IN NEBRASKA, 1972,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 04B.
W73-11120

BEHAVIOR OF GROUNDWATER FLOW SUBJECT TO TIME-VARYING RECHARGE,
Water Resources Engineers, Inc., Springfield, Va.
M. T. Tseng, and R. M. Ragan.
Water Resources Research, Vol 9, No 3, p 734-742, June 1973. 12 fig, 9 ref.

Descriptors: *Hydrologic systems, *Water resources development, *Groundwater movement, *Groundwater recharge, *Aquifers, *Methodology, Mathematical models, Systems analysis, Engineering, Planning, Streams.

The knowledge of dynamic response in a free surface groundwater flow system is of practical importance in many engineering applications. Problems such as drainage systems, earth dam designs, stream base flow estimate, and more recently groundwater pollution have been the major concerns of engineers and hydrologists. A numerical method is presented that is practical for application to the near field study of localized recharge for engineering feasibility and planning efforts. The dynamic response of two-dimensional unconfined aquifers subject to localized recharge is investigated. The variations of free surface profiles, discharges, and the flow patterns with respect to time in both fully penetrated and partially penetrated aquifer systems have been obtained by solving the governing partial differential equations numerically. The method treats the nonlinear free surface boundary as an initial condition, and the overall flow region has been solved as a boundary value problem at a given time. The numerical results agree with experimental data obtained from Hele-Shaw models. The method may be applied to study the quantitative and qualitative changes in groundwater reservoirs resulting from artificial or natural recharge. The method gives a point of departure for study of groundwater pollution. (Bell-Cornell)
W73-11142

COEFFICIENT OF PERMEABILITY OF HIGHLY PLASTIC CLAYS,
Kanazawa Univ. (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 02G.
W73-11199

A SMALL DIMENSION PROBE FOR THE DETERMINATION OF GROUND WATER FLOW DIRECTION,
Technical Univ., Lodz (Poland).
T. Przedecki, and S. Sztromajer.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 259-261, 1971. 1 fig, 5 ref.

Descriptors: *Groundwater movement, *Tracers, *Radioactivity techniques, *Instrumentation,

Tracking techniques, Radioisotopes, Adsorption, Water wells.

A method to determine groundwater flow in single wells is based on introducing an isotope solution into the borehole as an indicator and measuring the direction of the water movement with a probe. In the probe, detection of the indicator substance is indirect. It is absorbed by ion exchangers and then, after the removal of the probe, the amount of te absorbed indicator is measured. The dimensions of the device allow its use in 150 mm holes. (K-napp-USGS)
W73-11200

STREAM DEPLETION FACTORS, ARKANSAS RIVER VALLEY, SOUTHEASTERN COLORADO: A BASIS FOR EVALUATING PLANS FOR CONJUNCTIVE USE OF GROUND AND SURFACE WATER,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-11221

ARTIFICIAL RECHARGE OF GROUND-WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-11321

CALCITE SATURATION IN AN EASTERN KENTUCKY KARST STREAM,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W73-11391

GROUND-WATER BASIC DATA OF CAVALIER AND PEMBINA COUNTIES,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 04B.
W73-11397

LOCATION AND DETERMINATION OF DEPTHS OF SUBSURFACE UNDULATIONS BY SEISMIC METHODS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08E.
W73-11398

DISTRIBUTION AND COMPOSITION OF MINERAL WATER IN THE TUVA AUTONOMOUS REPUBLIC (ZAKONOMERNOSTI RASPROSTRANENIYA I SOSTAV PODZEMNYKH MINERAL'NYKH VOD TUVY),
Institut Zemnoi Kory, Irkutsk (USSR).
Ye. V. Pinneker, Yu. I. Kustov, and A. I. Krutikova.
Geologiya i Geofizika, No 11, p 68-78, November 1971. 1 fig, 2 tab, 9 ref.

Descriptors: *Water chemistry, *Water types, *Mineral water, Thermal water, Saline water, Acidic water, Thermal springs, Cold springs, Water temperature, Gases, Structural geology, Maps.
Identifiers: *USSR (Tuva ASSR), *Mineral springs, Mineralization, Radon, Balneology.

To construct a map of mineral water in East Siberia on a scale of 1:2,500,000 investigations were conducted in the Tuva ASSR in 1966-67. Mineral water in the Republic is divided into 8 types: (1) nitrogen thermal water; (2) carbonated thermal water; (3) carbonated nonthermal water (temperature < 20 deg C); (4) radon nonthermal water; (5) sodium-chloride saline water; (6) acidic water (pH < 5.5); (7) low-salinity, nonthermal water in a weak hydrogen-sulfide solution (H2S > 0.01 g/liter); and (8) arsenic-bearing water. Five hydromineral regions are identified: (1) the Eastern Sayan region of carbonated water and nitrogen thermal springs; (2) the Altay-Western Sayan region of nitrogen thermal springs; (3) the Khubsugul'skaya region of nitrogen thermal springs; (4) the Tuva region of mineral water of mixed composition; and (5) the Ubsu-Nur region of chloride and sulfate waters and brines. Thermal and carbonated waters are associated with fractures and recent volcanism; radon waters are confined to granitoid intrusions; and saline water is developed within intermontane valleys. As a result of investigations, the number of known mineral springs in the Republic has increased from 22 to 34. (Josefson-USGS)
W73-11412

THE ENVIRONMENTAL TRITIUM CONCENTRATION OF UNDERGROUND WATER AND ITS HYDROLOGICAL INTERPRETATION,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
G. B. Allison, and J. W. Holmes.
Journal of Hydrology, Vol 19, No 2, p 131-143, June 1973. 5 fig, 3 tab, 23 ref.

Descriptors: *Tritium, *Groundwater movement, *Water balance, Recharge, Discharge (Water), Tracers, Mixing, Springs, Australia, Model studies.

Models which attempt to correlate the tritium concentration of water taken from aquifers to aquifer parameters are discussed. One model takes into account flow along individual streamlines and relates aquifer parameters to the observed tritium concentration at outflow. For the Gambier Plain unconfined aquifer in southern Australia, the calculated tritium concentration at outflow derived from known aquifer parameters is 0.7 T.U. The measured tritium concentration of several springs at outflow is also 0.7 T.U. Using the complete mixing model and the approximation that samples withdrawn from the aquifer on Eyre Peninsula, South Australia, are fully mixed, the mean annual recharge for the area is estimated at 3 cm/yr. (Knapp-USGS)
W73-11544

THE INFLUENCE OF DELAYED DRAINAGE ON DATA FROM PUMPING TESTS IN UNCONFINED AQUIFERS,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton.
Journal of Hydrology, Vol 19, No 2, p 157-169, June 1973. 2 fig, 9 ref.

Descriptors: *Aquifer testing, *Drawdown, *Water yield, Aquitards, Permeability, Hydrogeology, Anisotropy, Equations.
Identifiers: Delayed yield.

Equations are given for the flow to a pumped well in an aquifer having uniform anisotropy and overlain by a low-permeability aquitard. The water table is assumed to be located in the aquitard. Drainage from the capillary zone above the water table is taken into account. The formation constants may be evaluated by using type curves. A well-known pumping test is reanalyzed, using the given equations. The time-drawdown curves can be explained only by the existence of a low-permeability stratum in the vicinity of the water table. In this example the slow draining of the unsaturated zone above the water table seems to be a significant factor in determining the shape of the time-drawdown curves. (Knapp-USGS)
W73-11545

AVAILABILITY OF GROUNDWATER FOR PUBLIC-WATER SUPPLY IN CENTRAL AND SOUTHERN ESCAMBIA COUNTY, FLORIDA: INTERIM REPORT, JULY 1972,
Geological Survey, Tallahassee, Fla.
H. Trapp, Jr.
Geological Survey open-file report 72029, 1973, 100 p, 5 fig, 14 ref, 1 append.

Descriptors: *Groundwater resources, *Water wells, *Aquifers, *Water quality, *Florida, Well data, Aquifer characteristics, Water yield, Groundwater recharge, Water utilization, Water supply, Water resources development, Chemical analysis, Hydrologic data, Data collections, Water levels, Test wells, Drillers logs.
Identifiers: *Escambia County (Fla), *Pensacola (Fla).

Earlier hydrologic studies show that ample quantities of soft water of low dissolved solids content are obtainable from the sand-and-gravel aquifer in central and southern Escambia County, Fla. Some wells drilled for the city of Pensacola have yielded water with unacceptably high amounts of iron and carbon dioxide, and some wells have had low yields. The city, therefore, is seeking hydrologic information, including water-quality data, in an effort to avoid the high cost of well abandonment and to plan for future expansion of the water-supply system. The project area extends from the western end of Santa Rosa Island, through Pensacola to State Road 196 north of Quintette. The investigation included the collection of well data, chemical analyses of water samples, test drilling, radioactivity logging of test holes and other wells, and water-level measurements. Quality-of-water maps have been updated from the first year's report (See W72-09267), and graphic logs of the test holes drilled during the second year of the project are presented. (Woodard-USGS)
W73-11563

ARTIFICIAL RECHARGE IN THE WHITE-WATER RIVER AREA, PALM SPRINGS, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 04B.
W73-11565

GROUND-WATER QUALITY IN WISCONSIN THROUGH 1972,
Geological Survey, Madison, Wis.
C. L. R. Holt, Jr., and E. L. Skinner.
Wisconsin Geological and Natural History Survey Information Circular No 22, 1973. 148 p, 6 fig, 2 tab, 46 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Groundwater resources, *Water quality, *Wisconsin, Hydrologic data, Reviews, Evaluation, Water yield, Water analysis, Chemical analysis, Geochemistry, Dissolved solids, Aquifers, Water wells, Erosion rates.

Available information on the quality of groundwater in Wisconsin is summarized. Major sources for this information are more than 30 technical reports that describe groundwater resources and quality in river basins, counties, and special study areas. A background of chemical-quality data is presented on groundwater as it occurs in natural and man-modified environments. These data constitute a base for planning and managing the water and land resources of Wisconsin. The water quality monitoring program for goundwater is described. In Wisconsin, the average dissolved-solids content of groundwater discharged to lakes and streams and from wells is about 200 mg/liter; groundwater discharge is estimated to be 16 billion gallons per day; about 87 tons per square mile of mineral matter is being dissolved annually from soil and rocks. (Woodard-USGS)
W73-11568

ELECTRICAL-ANALOG MODEL STUDY OF A HYDROLOGIC SYSTEM IN SOUTHEAST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02A.
W73-11570

2G. Water in Soils

A NEW METHOD FOR THE SOIL MOISTURE MEASUREMENT (MOMIN'S METHOD),
J. Kubo.
Available from NTIS, Springfield, Va 22151 as N-72 28349, Price $3.00 printed copy; $0.95 microfiche. National Aeronautics and Space Administration Technical Translation TT F-14394, July 1972. 8 p, 3 fig, 4 ref. (Translation of 'Shin Dojo Suibun Sokuteiho (Momin Ho No Jisshi)', Agricultural Meteorology (Japan), Vol 8, p 108-110, 1953.

Descriptors: *Soil moisture meters, *Soil moisture, Measurement, Thermal conductivity, Instrumentation, Methodology, Soil temperature, Correlation analysis, Thermometer.
Identifiers: Metallic plate.

A new method for soil moisture measurement which utilizes thermal conductivity is presented. In the traditional method of utilizing the thermal conductivity, a metallic plate buried in the soil is heated electrically and its temperature measured, but this method is quite troublesome. In the experiment, the latter half of the bulb of a mercury thermometer was wound with a heating wire. This heating part was electrically and thermally insulated from the soil. The bulb was heated by a constant electric current, and the time was measured in seconds for the temperature to rise by 5 deg C. The principle of this method is that within the bulb, the half on which the heating wire is wound gains heat, while the other half, which is in contact with the soil, loses heat in a certain proportion due to the thermal conductivity of the soil. When the variation in the soil temperature is large, the linear relationship must be determined for at least 2 to 3 kinds of temperature range. Furthermore, if the contact between the tip of the bulb and the soil is not perfect, an unexpected error may be created; it also becomes necessary to obtain a linear relationship for each soil where the apparatus is installed. (Woodard-USGS)
W73-11117

ANALYSIS OF SOIL TEMPERATURES IN THE ARID ZONE OF INDIA BY FOURIER TECHNIQUES,
Central Arid Zone Research Inst., Jodphur (India).
A. Krishnan, and R. S. Kushwaha.
Agric Meteorol. Vol 10 No 1/2, p 55-64, 1972. Illus.
Identifiers: *Arid lands, Fourier avalysis, Harmonics, *India, Infiltration, Mass, Moisture, Monsoons, Rainfall, *Soil temperature.

Harmonic analyses of weekly means of soil temperatures were made at Jodhpur, India with sandy to loamy sand soil (clay content 6-8%). The amplitudes and phase angles corresponding to various depths in respect of different harmonics are presented. The amplitudes for various depths vary between 4.8 deg C and 9.1 deg C for first harmonic and decrease sharply with higher order harmonics. The values for 4th harmonic are 0.12-0.64 deg C only. The warmest soil near the soil surface occurs on June 28 while at 120 cm depth, the highest temperature maximum occurs on July 29, a delay of 1 mo. The 2nd and 3rd harmonics represent 8-22 and 0.6-4% of total variance, respectively. This effect of monsoon period on soil temperature profile at Jodhpur is due to infiltration of rainfall. The change in soil temperature pattern after July due to occurrence of the southwest monsoon is well reflected, if the 3rd harmonic is superimposed on the sum of the 1st 2 harmonics. The thermal diffusivity computed from amplitude variation and from phase displacement do not agree-showing the non-applicability of the theory of heat conduction in a semi-infinite homogeneous medium for Jodhpur soil. The mass movement of moisture during the monsoon and flow of moisture in the vapor phase probably invalidate the application of this simple theory.--Copyright 1972, Biological Abstracts, Inc.
W73-11177

MOISTURE TRANSFER AND FROST HEAVE IN LOAMS,
B. I. Dalmatov, V. D. Karlov, and V. M. Sokolova.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 53-59, 1971. 4 fig, 2 tab, 6 ref.

Descriptors: *Frost action, *Moisture content, *Soil water movement, *Frost heaving, Heat transfer, Freezing, Thawing, Unsaturated flow, Soil mechanics.

The moisture transfer process in loam depends on density and moisture content. Analysis for this process was based on the methods of heat transfer theory. Moisture transfer potential fully characterizes the moisture migration intensity, and the migration depends basically on moisture gradient. The experimentally established relationship between moisture transfer potential and initial moisture volume of loam has a linear character. Experiments on frost heave were carried out with loam samples having different densities and consistencies. A linear relationship between frost heave and initial moisture content was established. Testing of nonsaturated samples showed the influence of volume increase in water on frost heave, the formation of new pores and microfissures, and shrinkage. (Knapp-USGS)
W73-11193

BEHAVIOUR OF FINE SANDS AND SILTS DURING THE RISE OF GROUND-WATER LEVEL,
Ceskoslovenska Akademie Ved, Prague. Ustav Teoretiche a Aplikovane Mechaniky.
J. Havilicek.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 121-126, 1971. 3 fig, 4 ref.

Descriptors: *Soil mechanics, *Foundations, *Saturation, *Silts, *Bearing strength, Water level fluctuations, Water table, Sands, Infiltration, Soil strength, Soil engineering, Soil physical properties, Soil structure, Soil water, Soil moisture.
Identifiers: *Soil liquefaction.

Saturation of some dry silty soils leads to their liquefaction. This phenomenon is particularly important for countries where the summers are very hot and dry, the winters rainy, and where the subsoil is silty. In the calculation of the bearing capacity of silty soils, decrease of safe foundation depth must be taken into account. (Knapp-USGS)
W73-11194

PORE PRESSURE MEASUREMENTS IN AELOTROPIC PEAT,
Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Civil Engineering.
K. V. Helenelund.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 127-134, 1971. 6 fig, 9 ref.

Descriptors: *Peat, *Pore pressure, *Anisotropy, *Soil physical properties, *Soil tests, Soil strength, Consolidation, Shear, Soil mechanics.
Identifiers: *Aelotropic peat.

Pore pressures in fibrous peat show great variations in the pore water pressure depending on the direction of the applied stress. High pore water pressures are observed in vertical tests with the major principal stress perpendicular to the horizontal fiber plane of the peat. Considerably smaller pore water pressures are observed in horizontal tests, with the major principal stress acting parallel to the fiber plane. Due to the tensile strength of the fibers, the lateral displacements in vertical unconfined compression tests are small, and the dilatation is compensated by high pore water pressures. In horizontal tests the lateral tensile strength perpendicular to the fiber plane is small, the cross section of the sample increases, and the pore water pressure decreases. In this case a part of the load is carried by an effective fiber stress in an early stage of the test. The increase in pore water pressure is small until the angle between the fiber plane and the major principal stress exceeds 30 deg, and a considerable increase in the pore water pressure is observed when this angle exceeds 60 deg. (Knapp-USGS)
W73-11195

RELATIONSHIPS BETWEEN VOLUME AND PORE-WATER CHANGE AND SHEAR STRESS IN GRANULAR SOILS,
Ceskoslovenska Akademie Ved, Prague. Ustav Teoreticke a Aplikovane Mechaniky.
B. Kamenov.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 143-154, 1971. 6 fig, 11 ref.

Descriptors: *Soil mechanics, *Soil tests, *Sands, *Pore water, Stress, Strain, Shear, Compressive strength, Soil strength, Pore pressure, Density, Porosity.

Shear box and triaxial tests were made on Zbraslav sand. The shear box tests used constant and variable sample height, and both drained and undrained triaxial tests were made with initial pore-water pressure and with different cell pressures and initial densities. The influence of volume strain and pore-water pressure gradients on the shearing resistance was studied. The relations were linear and influenced by the loading path and stress level, by the geometrical arrangement of the structural system in question, and by the kinematic conditions of the deformation process. A method to find the residual shearing resistance based on the zero gradient of volume strain and pore-water pressure in triaxial tests is proposed. The residual resistance of granular soils was independent of the loading path. It is affected by the nature of the tested material and, if crushing of grains could take place, by the stress level in the failure plane. (Knapp-USGS)
W73-11197

BEHAVIOUR OF TRANSITION SOILS UNDER THE EFFECT OF WATER,
Technical Univ. of Budapest (Hungary).
A. Kezdi, L. Marczal, E. Biczok, and I. Kabai.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 165-176, 1971. 12 fig, 1 tab, 4 ref.

Descriptors: *Soil mechanics, *Soil moisture, *Soil strength, Soil structure, Loess, Silts, Sands, Clays, Bearing strength, Water levels, Saturation, Infiltration, Permeability, Hydraulic conductivity, Soil physical properties.
Identifiers: Soil liquefaction.

In Hungary most of the land surface is covered with transition soils between sand and clay. These soils include silts and silty fine sands. In the transition soils severe erosion occurs under the effect of surface water movement. When the soils are saturated, the weak cohesion rapidly disappears and the soil disintegrates; under the effect of inundation the loaded soil collapses. The phenomena taking place at the surface of grains are predominantly physical processes involving the interaction of water and surfaces of rough grains. The bond between the grains is weak, and the strength responds quickly and very sensitively to the change in water content. In the transition soils the pores are commonly large enough to allow a relatively free movement of water. Under the effect of dynamic load, these soils behave very elastically. (Knapp-USGS)
W73-11198

COEFFICIENT OF PERMEABILITY OF HIGHLY PLASTIC CLAYS,
Kanazawa Univ. (Japan). Dept. of Engineering.
Y. Nishida, H. Koike, and S. Nakagawa.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 219-224, 1971. 5 fig, 5 ref.

Descriptors: *Permeability, *Clays, *Clay minerals, *Void ratio, Consolidation, Adsorption, Compaction, Soil physical properties, Expansive clays, Soil water movement.

From theoretical calculation of the water flow in the pore space of clays where the individual particles are surrounded by absorbed water layers, a relationship was established between the coefficient of permeability and the void ratio. By extending the use of the Hazen-Poisseuille equation to highly plastic clays, the coefficient of permeability was found to be proportional to the 5th power of the void ratio. (Knapp-USGS)
W73-11199

EFFECT OF SOIL, COVER, SLOPE, AND RAINFALL FACTORS ON SOIL AND PHOSPHORUS MOVEMENT UNDER SIMULATED RAINFALL CONDITIONS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-11208

USE OF PHYSICAL METHODS TO EXPAND SOIL SURVEY INTERPRETATIONS OF SOIL DRAINAGE CONDITIONS,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. Bouma.
Soil Science Society of America Proceedings, Vol 37, No 3, p 413-421, May-June 1973. 9 fig, 36 ref.

Descriptors: *Hydraulic conductivity, *Model studies, *Soil water movement, Numerical analysis, Hydraulic models, Permeability, Soil physical properties, Soil surveys, Soil physics.

Complex numerical procedures and simple approximate physical methods, both requiring hydraulic conductivity and moisture retention data, can be used to calculate hydrodynamic soil behavior for a variety of simplified boundary conditions. Two approximate methods were applied to four Wisconsin soils in which measurements of hydraulic conductivity had been made in situ. Two soils that had been placed previously in different drainage classes on the basis of differences in soil mottling, actually had comparable hydrologic properties. Soil survey methods do not provide the quantitative data needed for predicting what soil behavior will be under environmental conditions that have changed temporarily or permanently. (Knapp-USGS)
W73-11210

RELATIONSHIPS BETWEEN SATURATED HYDRAULIC CONDUCTIVITY AND MORPHOMETRIC DATA OF AN ARGILLIC HORIZON,
Wisconsin Geological and Natural History Survey, Madison.
J. L. Anderson, and J. Bouma.
Soil Science Society of America Proceedings, Vol 37, No 3, p 408-413, May-June 1973. 3 fig, 2 tab, 14 ref.

Descriptors: *Hydraulic conductivity, *Saturated flow, *Soil water movement, Tracers, Sampling, Pores, Permeameters, Cores, Equations.
Identifiers: *Soil morphometry, *Pore geometry.

A method of calculating saturated hydraulic conductivity in soil on the basis of morphometric data yielded reproducible results for seven soil peels sampled in the argillic horizon of a Batavia silt loam. Calculated values were reasonably close to those measured in situ with the double tube method. The method was also successfully applied to impregnated horizontal sections through soil cores. Dye studies demonstrated the validity of some of the underlying assumptions of the method, which predicts a strong relationship between core height and measured hydraulic conductivity. Experiments confirmed this relationship and a representative core size was defined for the studied horizon using the morphometric data. (Knapp-USGS)
W73-11211

STEADY-STATE SEEPAGE IN A HILLSIDE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. C. A. Morin, and A. W. Warrick.
Soil Science Society of America Proceedings, Vol 37, No 3, p 346-351, May-June 1973. 4 fig, 2 tab, 11 ref.

Descriptors: *Seepage, *Soil water movement, *Equations, *Slopes, Mathematical studies, Flow nets, Overland flow, Infiltration, Soil erosion.

Two-dimensional seepage of water from a hillside adjoining a flat horizontal plane at its lower end was solved using the complex potential function. The complex potential is a function of position and can be used to determine the hydraulic potential, the stream function, and the velocity distribution. The flow velocity and direction are closely related to movement of chemical constituents into and from the soil surface, amount of subsurface flow and surface flow, erosion hazards and seepage spots. Two cases were considered: in the first a straight slope of finite length intersects an infinitely wide horizontal plane; in the second, a horizontal plane of finite width is between two symmetric hillsides. Flow nets and graphical relations show the flow patterns. (Knapp-USGS)
W73-11212

SIMULTANEOUS TRANSPORT OF CHLORIDE AND WATER DURING INFILTRATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02K.
W73-11213

INFLUENCE OF SOIL TEMPERATURE AND MOISTURE ON SURVIVAL AND GROWTH OF STRANDS OF PHYMATOTRICHUM OMNIVORUM,
Ruhr-Universitaet Bochum (West Germany). Lehrstuhl fuer Pflanzenphysiologie.
For primary bibliographic entry see Field 03F.
W73-11248

RETENTION AND RELEASE OF SOIL WATER AS RELATED TO MINERALOGY OF THE SOIL CLAYS,
Indian Agricultural Research Inst., New Delhi. Div. of Soil Science and Agricultural Chemistry.
M. H. Ali, and T. D. Biswas.
J Indian Soc Soil Sci. Vol 19, No 4, p 363-368. 1971. Illus.
Identifiers: *Clays (Bentonite), Illite, Kaolinite, Mineralogy, Montmorillonite, Retention, *Soil water.

Retention and release of water were maximum in bentonite (clay) followed by illite and kaolinite. With rise in matric suction, the difference in the retention by these clay minerals decreased. At 10 centibar, bentonite retained 244% more water than kaolinite, whereas at 15 bar, it was merely 9%. The black soils, being very fine textured and having montmorillonite as the dominant clay mineral, retained and released the largest amount of water, followed, in general, by the alluvial (illitic) and lateritic (kaolinitic) soils. Moreover, the water retention curves of the back, alluvial, red and lateritic soils resemble those of bentonite, illite, and kaolinite respectively. Both the nature and amount of the clays are important factors in determining the water retention characteristics of soils.--Copyright 1972, Biological Abstracts, Inc.
W73-11256

MORPHOLOGY AND DISTRIBUTION OF SOILS OF LOWER IB WATERSHED,
Indian Agricultural Research Inst., Nagpur. All India Soil and Land Use Survey.
J. C. Bhattacharjee, N. K. Shende, N. K. Barde, and T. B. Raut.
J Indian Soc Soil Sci. Vol 19, No 4, p 423-439. 1971. Illus.
Identifiers: Distribution, *India (Ib watershed), Morphology, *Soils, Watersheds.

Widely different soils following sequences of geomorphic components were recognized and arranged in 2 catenas in lower Ib watershed covering parts of the districts of Sundergarh and Sambalpur in Orissa State (India). Topographic variations regulate hydrological conditions modifying soil climate as locally arid or locally humid which, in turn, influences pedogenic processes. Morphological features like depth, color distribution of clay in profiles, etc. and also physico-chemical properties of different members of these 2 catenas distinctly indicate the heterogeneity in soil development and reflect direct relationship with different hydrological conditions modifying soil climate due to topographical variations, while overhead climate and parent materials are of subsidiary values.--Copyright 1972, Biological Abstracts, Inc.
W73-11258

INVESTIGATION ON ERODIBILITY AND WATER STABLE AGGREGATES OF CERTAIN SOILS OF EASTERN NEPAL,
Soil Conservation Research, Demonstration and Training Center, Chatra (Nepal).
For primary bibliographic entry see Field 02J.
W73-11272

MEASUREMENT OF CONTACT ANGLE OF WATER IN SOILS AND SAND,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
Dhan Pal, and S. B. Varade.
J Indian Soc Soil Sci. Vol 19, No 4, p 339-343. 1971.
Identifiers: *Contact angle (Water), Equations, Measurement, Poiseuilles equation, *Sand, *Soils.

The contact angle of water in soils and sand was measured using the infiltration and capillary rise method respectively. The contact angle of water to the soil is not 0 and even in wettable soil the effective contact angle is much larger. The order of magnitude of the soil-water contact angle among 5 soils was as follows: Sandy loam soil > red soil > laterite soil > black soil > clay soil. In sand, the magnitude of contact angle was not influenced by the treatment of hydrophobic substance such as pyrogallol used in present study. The Poiseuille's

equation worked well for soils but not for pure sand.-oCopyright 1972, Biological Abstracts, Inc.
W73-11273

DETERMINATION OF TRACE MERCURY IN SOIL AND ROCK MEDIA,
Colorado School of Mines, Golden. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-11297

INCIDENCE OF MERCURY IN ILLINOIS PHEASANTS,
Illinois State Natural History Survey, Urbana.
For primary bibliographic entry see Field 05A.
W73-11305

POSSIBILITY OF REDUCING NITROGEN IN DRAINAGE WATER BY ON FARM-PRACTICES, (BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA).
Bureau of Reclamation, Fresno, Calif.
For primary bibliographic entry see Field 05B.
W73-11324

CAPILLARY-DIFFUSION AND SELF-DIFFUSION OF LIQUID WATER IN UNSATURATED SOILS,
Kentucky Univ., Lexington. Dept. of Agronomy.
V. L. Quisenberry, Jr.
M Sc Thesis, 1971. 79 p, 18 fig, 31 ref. OWRR A-011-KY (2).

Descriptors: *Soil moisture, *Diffusion, *Capillary water, *Unsaturated flow, *Kentucky, Soils, Soil water movement, Saturated flow, Laboratory tests, Analytical techniques, Inflow, Discharge (Water), Moisture content, Agriculture.
Identifiers: Diffusion coefficients (Soils).

Capillary-diffusion and self-diffusion coefficients were determined by laboratory methods for several Kentucky soils: Maury silt loam, Pembroke silt loam, Eden silty clay loam, Burgin silty clay loam, Henry silt loam, Huntington loam, and Yolo loam. Capillary-diffusion coefficients were measured by use of inflow and outflow methods. With both methods the capillary-diffusion coefficients decreased very rapidly with decreasing water content. The soils with lower clay contents had higher diffusion coefficients over the entire moisture content range studied, 0 to 1 bar tension, than the soils with the higher clay contents. A comparison of the two methods showed that the inflow method yielded slightly higher capillary-diffusion coefficients for the Yolo, Huntington, and Pembroke. The inflow method gave coefficients about an order of magnitude greater than the outflow method for the Burgin silty clay loam. This difference was explained on the basis of the swelling property of the dominant clay mineral in the soil, montmorillonite. The two methods yielded approximately the same values for the Maury and the Eden. (Woodard-USGS)
W73-11390

THE CLASSIFICATION OF ARID ZONE SOILS: I. AN APPROACH TO THE CLASSIFICATION OF ARID ZONE SOILS USING DEPOSITIONAL FEATURES,
Hunting Technical Services Ltd., Boreham Wood (England).
S. Western.
J Soil Sci., Vol 23, No 3, p 266-278, 1972. Illus.
Identifiers: Aeolian, Anthropic, Arid zones, Classifications, Depositional features, Depth, Fluvial, Irrigation, Littoral, Salinity, *Soils (Arid zone), Stratification, Texture, *Soil classification, Sediments.

Soils in regions of arid and semi-arid climates exhibit only limited pedogenetic profile development, and they might be more usefully described, classified and mapped in terms of their depositional character. The main source of understanding of their origins and practical significance is likely to be the sedimentary geomorphology of the area concerned, rather than the minimal pedogenetic features. The term 'sedosols' is proposed for these soils and a method of classification is outlined, based on depositional features and origins. Sub-orders are based on mode of deposition to give 4 sedimentary families, viz. fluvial, littoral, aeolian, and anthropic. In lower category classification, series based on pedogenetic features cannot be defined and are replaced by the 'depositional series' characterized by the types of sediment (e.g. coarse textured, fine textured, saline, non-saline). Typical phases are based on soil depth and degree of erosion. Salinity induced by irrigation is also best recognized at phase level as it is essentially an ephemeral feature. The 3 major differentiating characteristics of sedosols are soil texture, degree of depositional stratification and effective soil depth. (See also W73-11418)--Copyright 1973, Biological Abstracts, Inc.
W73-11417

THE CLASSIFICATION OF ARID ZONE SOILS: II. THE CLASSIFICATION OF SEDOSOLS IN SOUTH ARABIA,
Hunting Technical Services Ltd., Boreham Wood (England).
S. Western.
J Soil Sci, Vol 23, No 3, p 279-297, 1972. Illus.
Identifiers: *Arabia, Arid zones, Deposition, Mapping, Moisture, Morphology, Sedimentary, *Sedosols, *Soils (Arid zone), *Soil classification.

In the arid environment of South Arabia the soils (sedosols) are not significantly affected by pedogenetic processes. Classification of these soils is therefore in accordance with the principles based upon a consideration of the mode of deposition rather than on considerations of pedogenesis. Sedimentary geomorphology, soil classification, soil mapping are discussed for 2 areas of South Arabia. Mapping purity was satisfactory and reliability was probably greatest in series that were wholly anthropic or wholly natural in origin. In classifying land for single-flood irrigation agriculture, the total readily available moisture capacity is the major land classification factor. It is a function of texture and effective depth, modified in places by severe stratification. (See also W73-11417)--Copyright 1973, Biological Abstracts, Inc.
W73-11418

ADSORPTION CHARACTERISTICS OF OPALINE CLAYS FROM THE EOCENE OF GEORGIA,
Georgia Univ., Athens.
R. E. Carver.
In: Proceedings of the Seventh Forum on Geology of Industrial Minerals, April 28-30, 1971, Tampa, Florida; Florida Department of Natural Resources Special Publication No 17, p 91-101, June 1972. 5 fig, 5 tab, 11 ref. OWRR A-006-GA (11).

Descriptors: *Adsorption, *Moisture uptake, *Clays, *Mineralogy, Georgia, Adsorption, Physical properties, Chemical properties, Analytical techniques, X-ray diffraction, Porosity, Water vapor, Correlation analysis, Montmorillonite, Quartz, Industrial production.
Identifiers: *Fuller's earth, Opaline clays, Ethylene glycol.

Opaline clays from central and eastern Georgia are widely used as industrial and domestic absorbants, principally as insecticide carrier and animal litter. The clays are classified as fuller's earth, although they are somewhat atypical of the group, since opal (cristobolite) is commonly the dominant clay-sized mineral. An investigation of absorption characteristics indicated that water vapor absorption (264 days) is related to opal content as determined by x-ray diffraction peak height ratios. Ethylene glycol vapor absorption is related to montmorillonite content. Contact absorption of water is complexly related to surface absorption, porosity, opal content and montmorillonite content, and may be as great as 112% of the original sample weight. The most absorbent clays are highly porous (to 65%) and contain both montmorillonite and opal. (Woodard-USGS)
W73-11536

RELATIONSHIPS BETWEEN MOISTURE RETENTION AND PARTICLE SIZE DISTRIBUTION OF THE SOIL,
Fort Hare Univ. (South Africa). Fakultaet Landbou.
H. V. H. Van Der Watt.
Agrochemophysica Vol 3, No 2, p 33-34, 1971.
Identifiers: Distribution patterns, Hydrometer methods, *Soil moisture, Retention, Soils, *Soil particle size, *Regression analysis.

In the soils examined, moisture retention and 'available moisture' can be estimated with fair accuracy from particle size distribution. The latter is determined by Van der Watt's (1966) hydrometer method. Data collected were subjected to multiple linear regression analysis with an IBM 1130 computer.--Copyright 1972, Biological Abstracts, Inc.
W73-11634

2H. Lakes

COMPUTER SIMULATION OF EUTROPHICATION,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W73-11051

AN IN SITU EVALUATION OF NUTRIENT EFFECTS IN LAKES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 05C.
W73-11070

PHOSPHORUS RELEASE FROM LAKE SEDIMENTS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05C.
W73-11072

ACCRETION RATES OF FRESHWATER MANGANESE DEPOSITS,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 02J.
W73-11088

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-11089

PARTITIONING OF A BRACKISH WATER HABITAT BY COPEPOD SPECIES,
Ghent (Belgium). Dept. of Zoology Rijksuniversiteit.
For primary bibliographic entry see Field 05A.
W73-11130

ISOLATION OF SALMONELLAE FROM MODERATELY POLLUTED WATERS,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 05A.
W73-11134

WATER QUALITY MODELS FOR TOTAL COLIFORM,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-11135

BATHYMETRIC RECONNAISSANCE OF WILD HORSE RESERVOIR, ELKO COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.
W73-11219

BATHYMETRIC RECONNAISSANCE OF WEBER RESERVOIR, MINERAL COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.
W73-11220

THE EVOLVING ROLE OF THE FEDERAL GOVERNMENT IN THE MANAGEMENT OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 06E.
W73-11247

LIMNOLOGY OF YELLOWTAIL RESERVOIR AND THE BIG HORN RIVER,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 05C.
W73-11331

CIRCULATION PATTERNS IN LAKE SUPERIOR,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
S. L. Lien.
Ph.D. Thesis, 1973. 202 p, 3 tab, 70 fig, 64 ref, 3 append. OWRR B-009-WIS (6). 14-01-0001-1057.

Descriptors: Lakes, Mixing, *Water circulation, *Stratification, Movement, Winds, *Bathythermography, *Water temperature, *Water currents, Coriolis force, Model studies, *Lake Superior, Mathematical models, Energy transfer.
Identifiers: Keweenaw Peninsula, Isle Royale.

Lake circulation studies were directed toward Lake Superior for the purpose of broadening the quantitative understanding of large-scale circulation patterns induced by wind and atmospheric pressure variations over lakes under homogeneous conditions. The effects of lake geometry--both horizontal and depth variation--of bottom conditions--slip or no-slip--and of wind stress distributions on the movement of water are considered. Because of the large-scale water motion, Coriolis forces were included in the models. An iteration scheme is used for the numerical solution of steady-state flow conditions in a homogeneous lake, and an explicit scheme is applied to the transient flow situation. Laboratory results generated on a physical rotary, vertically distorted model of Lake Superior indicate the patterns that result from wind-generated circulation. Uniform density conditions occur in the lakes during the late fall and spring seasons. By using a diverse approach of combining many sampling techniques and methods of analysis, it was possible to detect and define the nature of the temperature and current patterns for the study area. (Kerrigan-Wisconsin)
W73-11342

PRESERVATION OF LAKE BAYKAL (OB OKHRANE OZERA BAYKAL),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 05C.
W73-11407

DISTRIBUTION OF TRACE ELEMENTS IN BODIES OF WATER OF KAZAKHSTAN (RASPREDELENIYE MIKROELEMENTOV V VODOYEMAKH KAZAKHSTANA),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Khimicheskikh Nauk.
For primary bibliographic entry see Field 02K.
W73-11413

MAJOR AND TRACE ELEMENT LOADING OF CENTRAL MICHIGAN LAKES,
Michigan State Univ., East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-11427

PREIMPOUNDMENT STUDY, CARTERS LAKE.
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 06G.
W73-11530

BATHYMETRIC RECONNAISSANCE OF LAKE TAHOE, NEVADA AND CALIFORNIA,
Geological Survey, Carson City, Nev.
F. E. Rush.
Nevada Division of Water Resources, Water Resources-Information Series Report 17, 1973. 1 sheet, 6 fig, 3 tab, 8 ref.

Descriptors: *Lake morphology, Lake morphometry, *Bathymetry, *Hydrologic data, Water quality, Water temperature, Sedimentation, Inflow, Discharge (Water), Streamflow, Dam design, Water levels, Precipitation (Atmospheric), California, Nevada.
Identifiers: *Lake Tahoe (Calif and Nev).

This bathymetric map (scale 1:62,500) of Lake Tahoe in California and Nevada is based on a soundings map of the U.S. Coast and Geodetic Survey (1923). The deepest sounding in the lake, 1,646 feet and the only sounding greater than 1,600 feet, was about 6 miles due east of the Truckee River outlet and along the axis of the lake. Most of the steep slopes shown by the close spacing of the bathymetric coutours on the east and west sides of the lake are of fault origin. In addition, a fault scarp extends southwestward from Stateline Point at the north end of the lake towards the deepest point in the lake. About 2 miles north of Emerald Bay at Rubicon Point, the lake depth increases 1,300 feet in about the same horizontal distance, producing a bottom slope of about 45 deg from horizontal. Smaller maps and illustrations show general distribution of lake-bottom sediments; approximate mean annual precipitation in the Lake Tahoe basin; mean monthly flow of Upper Truckee River near Meyers, California; flow from Lake Tahoe to Truckee River; and annual variations in stage of Lake Tahoe. Summary tables are presented for lake morphometry, water temperature, water quality, light penetration, and dam-design. (Woodard-USGS)
W73-11531

SEISMIC SEICHES IN BAYS, CHANNELS, AND ESTUARIES,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
A. McGarr, and R. C. Vorhis.
In: The Great Alaska Earthquake of 1964: Oceanography and Coastal Engineering: National Academy of Sciences, Washington, D.C., p 25-28, 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Seismic waves, *Earthquakes, *Alaska, *Seiches, Frequency, Waves (Water), Tides, Surges, Water level fluctuations, Coasts, Lakes, Rivers, Reservoirs, Seismic properties, Travel time.

The great Alaska earthquake of 1964 produced seismic waves so large that they set bodies of water into oscillation throughout much of North America. Seismic surface waves, of both Love and Rayleigh types, were primarily responsible for the oscillations, or seiches, because these generally cause the largest amplitude of ground motion of all seismic waves at great distances from an epicenter. As the seismic surface waves passed beneath water-filled basins, their horizontal components generated the seiches. The surface waves most effective in the production of seiches had periods of the order of 15 seconds (or wavelengths of about 50 km). The distribution of seismic seiches in coastal regions is described and some features of the distribution are explained. A map shows seismic seiches from the Alaska earthquake recorded in conterminous United States. (Woodard-USGS)
W73-11532

REMOTE SENSING EVALUATION OF ENVIRONMENTAL FACTORS AFFECTING THE DEVELOPMENTAL CAPACITY OF INLAND LAKES,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 07B.
W73-11540

RESERVOIR BANK STORAGE,
Geological Survey, Menlo Park, Calif.
T. H. Thompson.
Available from NTIS, Springfield, Va 22151, as PB-214 416. Price $3.00 printed copy; $0.95 microfiche. Computer Contribution No 24, November 1972. 29 p, 1 fig, 5 ref, 2 append.

Descriptors: *Reservoir storage, *Hydrologic data, *Water level fluctuations, *Reservoirs, *Model studies, Computer models, Input-output analysis, Water inflow, Discharge (Water), Water yield, Hydrologic budget, Bank storage, Surface-groundwater relationships.
Identifiers: FORTRAN language.

A digital computer program is presented for computing daily bank storage from changes in reservoir surface elevations where the reservoir is bounded by a wedge-shaped aquifer of finite width. Cumulative bank-storage volumes are computed for two sets of transmissivity and storage coefficients. Each set is multiplied by a constant selected by the user and the volumes are then combined. A table of daily reservoir elevations, changes in elevations, changes in bank-storage volume, and total cumulative bank-storage volume at the end of each day is printed. A listing of the computer program is given at the end of the report along with sample input data and program output. (Woodard-USGS)
W73-11542

DRAININGS OF ICE-DAMMED SUMMIT LAKE, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 02E.
W73-11547

ANALYSIS OF LAKE ERIE WAVE PRESSURE DATA,
Northern Illinois Univ., De Kalb. Dept. of Geography.
For primary bibliographic entry see Field 08B.
W73-11548

A NEW CRAYFISH OF THE SUBGENUS JUGICAMBARUS FROM TENNESSEE WITH AN EMENDED DEFINITION OF THE SUBGENUS (ASTACIDAE, DECAPODA),
Tennessee Univ., Knoxville. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 05A.
W73-11590

NUTRIENT RATIO VARIATION IN RESERVOIR SEDIMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 05B.
W73-11591

MEASUREMENT OF EXCHANGEABLE INORGANIC PHOSPHATE IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05A.
W73-11596

SPRING PHYTOPLANKTON ABUNDANCE AND PRODUCTIVITY IN GRAND TRAVERSE BAY, LAKE MICHIGAN, 1970,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05B.
W73-11629

EPIDEMIOLOGICAL STUDY ON CLONDORCHIS SINENSIS AROUND LAKE BIWA, SHIGA PREFECTURE: I. SURVEY ON DISTRIBUTION OF PARAFOSSARULUS MANCHOURICUS, THE FIRST INTERMEDIATE HOST SNAIL (IN JAPANESE),
Kyoto Prefectural Univ. of Medicine (Japan).
M. Nagahana, Y. Yoshida, H. Sugihara, K. Matsuo, and K. Kondo.
Jap J Parasitol, Vol 20, No 2, p 103-108, 1971, Maps, English summary.
Identifiers: Clondorchis-sinensis, Distribution patterns, Epidemiological studies, Host, Lakes, Parafossarulus-manchouricus, *Snails, Survey, *Japan (Lake Biwa).

Of 97 stations investigated around the lake, 39 were positive for the snail. The fact that the snail host is distributed widely and abundantly in this lake suggests the possibility of further expanse of C. sinensis in this area. The effect of reclamation work and industrialization on the snail population should be considered.--Copyright 1972, Biological Abstracts, Inc.
W73-11654

FORECASTING QUARTERLY INFLOW OF WATER TO DNIEPER RIVER RESERVOIRS DURING THE COLD HALF OF THE YEAR (O PROGNOZIROVANII KVARTAL'NOGO PRITOKA VODY V DNEPROVSKIYE VODOKHRANILISHCHA ZA KHOLODNUYU POLOVINU GODA),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
M. V. Rudometov.
In: Formirovaniye i prognozy elementov gidrologicheskogo rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 112, p 27-43, Moscow, 1972. 5 fig, 7 tab, 4 ref.

Descriptors: *Forecasting, *Inflow, *Reservoirs, *Reservoir storage, Water storage, Discharge (Water), Soil moisture, Field capacity, Watersheds (Basins), Channels, Tributaries, Monthly, Curves.
Identifiers: *Ukraine, *Dnieper River.

Investigations to develop predictive relations for average quarterly discharges (in monthly increments) of inflow to the Kiev, Kanev, and Kremenchug Reservoirs for the last quarter of one year and the first quarter of the next were based on calculated relations constructed from data for 1933-40 and 1944-68. The factors used were water storage in the basin and water storage in the channel at the end of the preceding quarter. The relations examined for the Kiev and Kanev Reservoirs can be used to prepare sufficiently accurate forecasts of quarterly inflow in monthly increments for the fourth quarter but only tentative forecasts of inflow for the first quarter. For the Kremenchug Reservoir, sufficiently accurate forecasts of tributary inflow for the fourth quarter can be prepared, although use of these forecasts is considered inexpedient, since this inflow is small with respect to main-stream flow. (See also W73-11688) (Josefson-USGS)
W73-11691

2I. Water in Plants

PARASITE COPEPODS OF SOME FRESHWATER FISHES FROM NORTH CAROLINA,
Louisburg Coll., N.C.
K. W. Burris, and G. C. Miller.
J Elisha Mitchell Sci Soc Vol 88, No 1, p 18-20, 1972.
Identifiers: *Copepods, Fishes, New, *North Carolina, *Parasites.

During the summer of 1971, a study was made of the parasitic copepods found on 209 fishes representing 10 families and 28 species. Collections were made in 6 counties in North Carolina. Of the fishes, 56% were infested with 10 species of copepods belonging to 3 families and 3 genera. Twelve new host parasite records are reported, and North Carolina represents new locality records for all 10 species of copepods.--Copyright 1972, Biological Abstracts, Inc.
W73-11143

SEASONAL EMERGENCE OF SOME HIGH ARCTIC CHIRONOMIDAE (DIPTERA),
Waterloo Univ. (Ontario). Dept. of Biology.
H. V. Danks, and D. R. Oliver.
Can Entomol, Vol 104, No 5, p 661-686, 1972. Illus.
Identifiers: *Arctic, *Chironomidae, Diapause, *Diptera, Seasonal, Synchronized, Temperature.

The annual emergence of 11 chironomid species from shallow ponds in the area of Hazen Camp (81 degree 49'N, 71 degree 18'W) is considered. Features of emergence are very similar in all these arctic species, although different species emerge at slightly different times in the same habitat. In the deeper habitats, emergence from a deep site is slightly later than that from a shallower one in the same pond. There are very marked differences in times of emergence from pond to pond: emergence of 50% of the annual total for a given species may be reached in different ponds up to 3 wk apart. These differences from habitat to habitat mean that adults are present over the general Hazen area throughout the arctic summer. The time at which emergence begins in a given pond (or given site within a deeper pond) is primarily dictated by the temperature required for preemergence development, but also by other features of individual ponds. Pond temperatures near 4 or 5 C are most important in this respect. The time of first emergence differs between years in the same pond according to year-to-year temperature differences. Emergence of a given species is basically highly synchronized within a pond, but the emergence period may be prolonged by lowered temperatures acting as a threshold for adult emergence at about 7 C. The emergence pattern is less regular in shallow ponds in which the temperature fluctuates greatly, and it is more regular with lower peaks in deeper ponds. Males of a number of species generally emerge slightly before the females. Aquatic insect species are characterized as absolute spring species if all potential emergents overwinter as mature larvae (i.e., larvae in which no further growth is necessary before emergence) and also 'diapause' is present at this stage. To this category all of these high arctic species belong. They are apparently derived from 'absolute spring species' farther south, the life-cycles of which are preadapted to the shortness of the arctic season. Despite the potential for highly synchronized emergence which such species possess, this potential is not fully realized in the arctic because the irregular fluctuations of temperature there operate near values which may directly inhibit development and emergence.--Copyright 1972, Biological Abstracts, Inc.
W73-11148

PARASITES OF FISH FROM LAKE OF THE WOODS, ONTARIO,
Department of Lands and Forests, Maple (Ontario). Research Branch.
A. O. Dechtiar.
J Fish Res Board Can. Vol 29, No 3, p 275-283, 1972.
Identifiers: *Canada (Onterio), *Fish parasites, *Helminths, Human health, *Lake of the Woods, Parasites.

Results of a survey of the parasite fauna of fish from Lake of the Woods and adjacent lakes are presented. Over 600 fish representing 41 species were examined, and 170 species of parasites, mostly helminths, are recorded. Every species of fish and 97% of all fish examined carried at least 1 parasite. No parasites considered hazardous to human health were found. A number of parasites, reported elsewhere as contributors to fish mortalities, are recorded.--Copyright 1972, Biological Abstracts, Inc.
W73-11172

SOIL PHYSICAL FACTORS AFFECTING ROOT MORPHOLOGY AND STABILITY OF SCOTS PINE ON UPLAND HEATHS,
For primary bibliographic entry see Field 04A.
W73-11173

WATER POTENTIALS IN NONWILTED DIANTHUS GROWN IN DIFFERENT NUTRIENT SOLUTION CONCENTRATIONS,
Washington State Univ., Pullman.
K. A. Schekel, and J. J. Hanan.
Agron J. Vol 64, No 4, p 440-443. 1972. Illus.
Identifiers: Aperture, *Dianthus-Caryophyllus-D, Evaporation, Hydrostatic potential, Nutrients, Pressure, Stomata, Transpiration, Turgor, Xylem, Osmotic potential (Plants).

Experiments were undertaken to determine if Dianthus caryophyllus L. adjusted its internal osmotic potential downward with decreasing solution potential and the concomitant effects on water and turgor potentials. Plants were grown in a gravel substrate, irrigated 2-4 times daily with solutions of varying potentials, and measurements were made from before sunrise to noon or shortly thereafter on clear days. Plant osmotic potentials adjusted to increase the potential gradient between solution and plant with decreasing solution potential. There were no observable differences between treatments with respect to stomatal aperture or leaf diffusion resistance. The xylem hydrostatic pressure decreased to a greater extent in plants grown in -1.0 bar solutions than in those grown in -0.3 bar solutions as atmospheric evaporative demand increased. Polynomial regres-

sions of potential on evaporative demand had calculated correlations exceeding 0.90. Differentiation to determine the rate of hydrostatic potential change with change in evaporative demand showed the rate to be highest at low evaporative demands in plants grown in -1.0 bar solutions, gradually decreasing to 0 at high vapor pressure differences near 16 mm Hg. Carnations in -0.3 bar solutions had rates approaching 0 at low and high atmospheric demands, with a definite maximum near 9-10 mm Hg. The differences between hydrostatic potential and plant osmotic potential, ignoring matric and xylem potentials, showed carnations in -1.0 bar solutions to have consistently lower turgor potentials than plants grown in less concentrated solutions.--Copyright 1972, Biological Abstracts, Inc.
W73-11191

LEAD ACCUMULATION WITHIN NUCLEI OF MOSS LEAF CELLS,
Norges Tekniske Hoegskole, Trondheim. Dept. of Physics.
For primary bibliographic entry see Field 05E.
W73-11276

LEAD POLLUTION FROM A FACTORY MANUFACTURING ANTI-KNOCK COMPOUNDS,
Manchester Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05B.
W73-11290

THE FOOD OF BROWN TROUT IN LLYN ALAW, ANGLESEY, NORTH WALES,
Liverpool Univ. (England). Dept. of Zoology.
P. C. Hunt, and J. W. Jones.
J Fish Biol. Vol 4, No 2, p 333-352. 1972. Illus.
Identifiers: *Fish diet, Bottom fauna, *Brown trout, Trout, Wales (Llyn Alaw).

The results of the analysis of the contents of 274 brown trout stomachs taken over a period of 1 yr from Llyn Alaw, in Anglesey, North Wales, are described. The annual composition and seasonal changes of the diet were determined using number, volume and occurrence methods. The bottom fauna is classified according to accessibility to the trout as food and the utilization and apparent selection of the fauna by the trout is discussed. Food in relation to trout size is considered in detail.--Copyright 1972, Biological Abstracts, Inc.
W73-11354

THE EFFECTS OF WATER STRESS ON NITROGEN-FIXING ROOT NODULES: II. EFFECTS OF THE FINE STRUCTURE OF DETACHED SOYBEAN NODULES,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
For primary bibliographic entry see Field 03F.
W73-11415

THE EFFECTS OF WATER STRESS ON NITROGEN-FIXING ROOT NODULES: III. EFFECTS OF OSMOTICALLY APPLIED STRESS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
For primary bibliographic entry see Field 03F.
W73-11416

THE RESPONSE OF NATIVE MONTANA GRASSES TO SOIL WATER STRESS,
Montana State Univ., Bozeman. Water Resources Research Center.
L. Eddleman, and T. Nimlos.
Available from the National Technical Information Service as PB-221 538, $3.00 in paper copy, $0.95 in microfiche. Publication No. 37, 1972. 30 p, 6 tab, 52 ref. OWRR A-046-MONT (3).

Descriptors: *Soil moisture, *Soil water, Soil moisture meters, Montana, *Grasses, *Moisture stress, Drought tolerance, Water requirements, Soil-water plant relationships, Root development.
Identifiers: *Root elongation, *Leaf elongation.

In central Montana the major species show differences in their site requirements. The stable communities serve to interpret the environmental conditions of the habitat. Available soil moisture is a major causal factor involved in species distribution and abundance. Water is now more indispensable to plants than is light or temperature, but it can be considered of great importance due to the involvement of water in a large number of vital functions. In regions of wet winters and dry summers especially, the soil acts as the reservoir supplying water to the plant during the growth season. Water available for plant growth is supplied as rain and snow during the wet season, and where it is not maintained during the dry season by ground water, the supply is gradually exhausted. The rate of use and time of exhaustion of the available moisture supply depends greatly on the physical and physiological characteristics of the species. By holding most environmental factors (light, temperature, soil characteristics, and photoperiod) approximately constant, the effects of the available soil moisture can be observed. This study was designed to monitor root elongation and leaf elongation of three grass species while growing in soils with favorable moisture conditions (control) and soils with decreasing soil water potential (treatment) brought about by the use of a nonrenewable moisture supply. (Holje-Montana)
W73-11429

APPLICATIONS OF MULTISPECTRAL REMOTE SENSING TECHNIQUES TO HYDROBIOLOGICAL INVESTIGATIONS IN EVERGLADES NATIONAL PARK,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07B.
W73-11553

2J. Erosion and Sedimentation

NEUTRON ACTIVATION ANALYSIS OF BOTTOM SEDIMENTS,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05A.
W73-11067

FLUVIAL SEDIMENT IN SIXMILE CREEK SUBWATERSHED 6, NEAR CHISMVILLE, ARKANSAS,
Geological Survey, Little Rock, Ark.
H. R. Fancher, Jr.
Open-file report, 1971. 26 p, 9 fig, 7 tab, 4 ref.

Descriptors: *Sediment load, *Trap efficiency, *Arkansas, Sedimentation, Reservoir silting, Sediment yield, Bed load, Suspended load, Sands, Particle size.
Identifiers: *Sixmile Creek (Chismville Ark).

Fluvial sediments were measured in Sixmile Creek, Arkansas. From 1957 to 1970, 4,288 tons of suspended sediment discharged from subwatershed 6. During this time the average annual runoff was about 13.2 inches. Most of the sand carried into the reservoir was retained. The highest measured inflow-sediment concentration was 10,300 mg per liter. The highest measured outflow-sediment discharge was 49 tons. The trap efficiency of reservoir 6 was about 95% for the 14-year period of the study. (Knapp-USGS)
W73-11082

AN INVENTORY OF SUSPENDED SEDIMENT STATIONS AND TYPE OF DATA ANALYSIS FOR PENNSYLVANIA STREAMS, 1947-70,
Geological Survey, Harrisburg, Pa. Water Resources Div.
A. N. Ott, and A. B. Commings.
Open-file report, 1972. 24 p, 4 fig, 4 ref.

Descriptors: *Suspended load, *Data collections, *Pennsylvania, Instrumentation, Hydrologic data, Measurement, Sampling.

This is a compilation of the location, period of record, sampling frequency and type of data synthesis for suspended sediment carried by Pennsylvania streams. Data concerning suspended-sediment concentrations and loads, frequency of occurrence of suspended-sediment concentrations, and long-term trends of annual suspended-sediment loads are important tools for environmental managers. These data are required background for those concerned with establishing and enforcing erosion and sedimentation control regulations and sediment concentration or turbidity standards for water-quality criteria, or those concerned with designing for adequate long-term water storage in reservoirs, or for efficient municipal and industrial plant operation. (Knapp-USGS)
W73-11083

ONSHORE-OFFSHORE SAND TRANSPORT ON DEL MONTE BEACH, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
J. D. Williamson.
Available from NTIS, Springfield, Va 22151 AD-751 595, Price $3.00 printed copy; $0.95 microfiche. M Sc Thesis, September 1972. 62 p, 10 fig, 1 tab, 22 ref, 3 append.

Descriptors: *Beach erosion, *Sediment transport, Data collections, Sedimentation, Profiles, Waves (Water), Slopes, Surf, Sampling, *California, Sands, Littoral drift.

Daily sand volume transport values were calculated at a beach profile during a 2-month period. Wave data were recorded continuously directly seaward of the profile. Tide effects were largely filtered out by use of a lunar day (24.8 hours) sampling interval. Offshore sand transport occurred in isolated events of 1- to 2-day duration, and had a maximum value of 132.5 cubic feet per foot of beach width per lunar day. Onshore transport occurred over longer intervals of up to 7 days, and had a maximum value of 47.0 cubic feet per foot per day. Onshore-offshore transport over a 24.8-hour period depends, to a first approximation, on the mean wave steepness incident upon the beach and the initial beach slope for the period. If the initial beach slope is greater than the equilibrium slope associated with the existing wave conditions, or if the profile is initially at equilibrium and the wave steepness increases, sand will be moved offshore. The closer to equilibrium the beach is, the smaller the transports. (Knapp-USGS)
W73-11086

ACCRETION RATES OF FRESHWATER MANGANESE DEPOSITS,
Tata Inst. of Fundamental Research, Bombay (India).
S. Krishnaswami, and W. S. Moore.
Nature Physical Science, Vol 243, No 129, p 114-116, June 18, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Sedimentation, *Manganese, *Lakes, *Chemical precipitation, *Radioactive dating, Sedimentation rates, Bottom sediments, Radium radioisotopes.
Identifiers: *Manganese nodules.

Growth rates of manganese nodules were studied by radiometric dating techniques which, coupled

with a knowledge of their chemical composition, provide information regarding elemental deposition rates and their geochemistry in lacustrine environments. Two nodules were studied, one spherical nodule of about 2-cm diameter from Lake Alstern, Sweden, and a saucer-shaped concretion of about 2-cm thickness from Oneida Lake, New York (Dean nodule). The Ra-266 concentrations in both the nodules were very high, with a strong concentration gradient with depth. The Ra-266 activities in the nodules were much in excess compared to its parent, Th-230. The Ra-266 gradient in these concretions may be the result of radioactive decay. If this is true, the rate of accumulation of the nodules from Lakes Alstern and Oneida is only 1 to 3 mm per 1000 years, and the age of each of these nodules is about 6,500 years. (Knapp-USGS)
W73-11088

PRINCIPLES OF LANDSLIDE IDENTIFICATION FROM AERIAL SURVEY DATA (PRINTSIPY RASPOZNAVANIYA OPOLZNEVYKH PROTSESSOV PO MATERIALAM AEROFOTOS'YEMKI),
Moscow State Univ. (USSR). Chair of Gemorphology.
A. V. Sadov, and A. L. Revzon.
Vestnik Moskovskogo Universiteta, Seryia V, Geografiya, No 5, p 50-56, September-October 1972. 5 ref.

Descriptors: *Landslides, *Aerial photography, *Surveys, Remote sensing, Topography, Terrain analysis, Digital computers.
Identifiers: *USSR (Chatkal'skiy-Kuraminsky Mts.).

Identification of landslide processes from aerial photographic surveys was based on investigations in the Chatkal'skiy-Kuraminskiy mountain system in 1969-70. Identification of landslide processes has a complex hierarchical structure and is divided into a number of levels. Each level has its own alphabet of identifiable items, a list of features, and a set of gradations for these features. Results of the identification depend on technical conditions of the survey. Application of the principles of identification will increase reliability of landslide detection from aerial survey data, and the identification schemes developed will permit use of digital computers in processing the identifiable information. (Josefson-USGS)
W73-11100

UPPER PERMIAN GLACIOMARINE DEPOSITS IN THE KOLYMA RIVER BASIN (VERKHNEPERMSKIYE LEDOVO-MORSKIYE OTLOZHENIYA BASSEYNA ISTOKOV R. KOLYMY),
Severo-Vostochnoe Territorialnoe Geologicheskoe Upravlenie, Magadan (USSR).
O. G. Epshteyn.
Litologiya i Poleznyye Iskopayemyye, No 3, p 112-127, May-June 1972. 6 fig, 1 tab, 52 ref.

Descriptors: *Petrology, *Sediments, *Glacial sediments, *Glacial drift, *Geologic time, Paleozoic era, Structural geology, Rocks, Detritus, Granules, Particle size, Particle shape, Climatology, Ice, River basins, Chemical analysis.
Identifiers: *USSR (Kolyma River), *Permian period, Clastic sediments, Mudstones, Siltstones, Argillites, Slump (Mass movement), Volcanism, Paleogeography.

Upper Permian glaciomarine deposits possess all of the lithologic characteristics considered descriptive of present-day glaciomarine sediments. The postulate of a moderate or moderately cold climate in Late Permian time or, at any rate, for a considerable period of Kazanian time in the northeast USSR is being substantiated by lithologic evidence. Recurrent climatic fluctuations, reflected in the geologic profile by the presence of nonglacial deposits, occurred in Atkanian time together with changes in the ice conditions of the marine basin. The Atka suite within the Ayan-Yuryakh anticlinorium in the Yana-Kolyma folded region represents an age of maximum ice movement in Late Permian time. The Upper Permian glaciomarine deposits examined are graphic illustrations of the effects which climatic factors have on terrigenous marine sedimentation. (Josefson-USGS)
W73-11103

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04C.
W73-11113

PHYSICAL EROSION AND DENUDATION RATES IN CARTWRIGHT BASIN AND VICINITY, WILLIAMSON COUNTY, TENNESSEE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.
D. B. Smith.
Tennessee Water Resources Research Center, Knoxville, Report No 22, December 1972. 60 p, 7 fig, 4 tab, 10 ref. OWRR B-018-TENN (1). 14-31-0001-3650.

Descriptors: *Erosion, *Sedimentation, *Sedimentation rates, *Tennessee, Watershed (Basins).
Identifiers: *Cartwright Basin (Tenn), Williamson County (Tenn.), Franklin (Tenn.).

Physical erosion and denudation rates in a small carbonate stream basin were calculated from the amount of trapped sediment in farm ponds. Eight ponds within the basin and three just outside the basin yielded an average erosion rate 569 tons per square mile per year and a denudation rate 246 feet per million years (75.0 Bubnoffs). The lowest rate of sedimentation was 238 and the highest 1,180 tons/mi2/year with corresponding denudation rates from 102 to 510 ft/million years. These sedimentation rates are two to five times greater than those calculated theoretically from rates of chemical weathering and lithology. The observed sedimentation rates are believed to be enhanced by the influence of man. (Reesman-Vanderbilt)
W73-11140

EFFECT OF SOIL, COVER, SLOPE, AND RAINFALL FACTORS ON SOIL AND PHOSPHORUS MOVEMENT UNDER SIMULATED RAINFALL CONDITIONS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-11208

PHOSPHORUS LOSSES FROM FOUR AGRICULTURAL WATERSHEDS ON MISSOURI VALLEY LOESS,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 05B.
W73-11209

AN EVALUATION OF THE UTILITY OF AVAILABLE REMOTE SENSOR RETURNS FOR A STUDY OF SLOPE FAILURE PHENOMENA,
East Tennessee State Univ., Johnson City. Dept. of Geology.
For primary bibliographic entry see Field 07B.
W73-11216

BATHYMETRIC RECONNAISSANCE OF WEBER RESERVOIR, MINERAL COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.
W73-11220

INVESTIGATION ON ERODIBILITY AND WATER STABLE AGGREGATES OF CERTAIN SOILS OF EASTERN NEPAL,
Soil Conservation Research, Demonstration and Training Center, Chatra (Nepal).
D. C. Chakrabarti.
J Indian Soc Soil Sci. Vol 19, No 4, p 441-446. 1971.
Identifiers: Aggregates (Soil), Erodibility, *Nepal, *Soils (Forest), *Erosion ratio.

The values of certain indices of erodibility such as erosion ratio, dispersion ratio, clay ratio, etc. of the forest soils of Kosi catchment in eastern Nepal are lower than those of arable soils even though they are under unprotected forests. The forest soils contain higher percentage of water stable aggregates, organic C, Ca, P and higher exchange capacity than the arable soils. The values of E.R. (erosion ratio) tend to increase in arable soils and decrease in forest soils with increase in altitude. Besides E.R. value, other factors such as W.S. (water stable) aggregate, D.R. (dispersion ratio), organic C, etc. should be considered in erodibility studies of soils as they are closely correlated with E.R. The W.S. aggregate has been significantly correlated with water holding capacity, organic, C, P, exchangeable Ca, cation exchange capacity, C.E.C., D.R. and suspension percentage but not with clay and free iron oxide.--Copyright 1972, Biological Abstracts, Inc.
W73-11272

MERCURY--A CASE STUDY OF MARINE POLLUTION,
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
For primary bibliographic entry see Field 05B.
W73-11375

MAN'S ROLE IN THE MAJOR SEDIMENTARY CYCLE,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-11382

MANGANESE NODULES AND BUDGET OF TRACE SOLUBLES IN OCEANS,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 05B.
W73-11384

THE USE OF MODERN CHROMIUM ACCUMULATIONS TO DETERMINE ESTUARINE SEDIMENTATION RATES,
New Hampshire Univ., Durham. Jackson Estuarine Lab.
For primary bibliographic entry see Field 02L.
W73-11392

SEDIMENTATION IN THE DEEP-SEA AREAS ADJACENT TO THE CANARY AND CAPE VERDE ISLANDS,
Heidelberg Univ. (West Germany). Sediment Research Lab.
P. Rothe.
Marine Geology, Vol 14, No 3, p 191-206, March 1973. 4 fig, 8 ref.

Descriptors: *Sedimentation, *Atlantic Ocean, Bottom sediments, Provenance, Mineralogy, Sedimentation rates.
Identifiers: Canary Islands, *Cape Verde Islands.

Bottom sediments between the eastern Canary Islands and Morocco are principally of continental-shelf derivation with little material from the islands. The sediment is mostly Globigerina ooze with silt-size quartz and much clay. Clay minerals are iron-rich chlorite, illite, and smectite. Sedimentation rates are about 2-3 cm/1,000 years. The

mineralogy of the Inner Cape Verde Basin sediments studied is different from that of the Canary Islands. Quartz and dolomite are uncommon. The clay minerals are rare chlorite, almost no illite, and some smectite. Amorphus silica is abundant. Volcanic sands are mixed with the shallow-water carbonates. This sediment distribution within the Inner Cape Verde Basin reflects a combination of open marine conditions and a chain of volcanic islands forming a barrier against terrigenous sedimentation from the African continent. Average sedimentation rates are between 2 and 3 cm/1,000 years. In the Canaries the principal constituents are terrigenous. In both areas, but particularly in the Cape Verdes, sedimentation is discontinuous, because the steady accumulation of the normal marine materials is interrupted by fluxes of reworked shallow-marine sand. (Knapp-USGS)
W73-11393

SEDIMENTS IN THE ATLANTIC CORNER SEAMOUNTS: CONTROL BY TOPOGRAPHY, PALEO-WINDS, AND GEOCHEMICALLY-DETECTED MODERN BOTTOM CURRENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
B. A. McGregor, P. R. Betzer, and D. C. Krause.
Marine Geology, Vol 14, No 3, p 179-190, March 1973. 5 fig, 1 tab, 14 ref. ONR Contract N00014-68-A-0215-0003.

Descriptors: *Bottom sediments, *Atlantic Ocean, *Sedimentation, Erosion, Provenance, Ocean currents, Suspended load.
Identifiers: Corner seamount group.

The topography in the Corner seamounts area in the western North Atlantic was studied to determine its relationship to the sedimentation pattern. The areas of anomalously thick sediment accumulation that are found on the north side of the seamounts are related to volcanic activity as well as paleocurrent and wind patterns. An irregular sediment surface has been formed by slump structures and actively eroding bottom currents. The erosion also results in high particulate iron concentrations in the bottom water. (Knapp-USGS)
W73-11394

THE U.C.S. GRAIN-SIZE COMPARATOR DISC,
Unit of Coastal Sedimentation, Taunton (England).
For primary bibliographic entry see Field 07B.
W73-11395

ROLE OF IRON SULFIDES IN THE ACCUMULATION OF TRACE ELEMENTS IN BLACK SEA SEDIMENTS (ROL' SUL'FIDOV ZHELEZA PRI NAKOPLENII MIKROELEMENTOV V OSADKAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov, and L. S. Fomina.
Litologiya i Poleznyye Iskopayemyye, No 2, p 18-24, March-April 1972. 2 tab.

Descriptors: *Geochemistry, *Trace elements, *Sediments, *Sulfides, *Iron, Hydrogen sulfide, Pyrite, Molybdenum, Cobalt, Nickel, Copper.
Identifiers: USSR, *Black Sea.

The content of Mo, Co, Ni, and Cu was investigated in pyrite samples collected from recent deep-sea sediments in the hydrogen sulfide zone of the Black Sea. The CoO concentration in pyrite is 0.01%-0.025% (average 0.017%), and the average coefficient of accumulation in deep-water pyrite is 9.3 (3.8-15.6). The NiO concentration in pyrite is 0.041%-0.402% (average 0.15%), and the coefficient of accumulation varies between 2.6 and 40. The CuO concentration in pyrite is 0.083%-0.195% (average 0.128%), and the average coefficient of accumulation is 20.5 (14.5-33.1). Very high and absolute concentrations of MoO3 (0.023%-0.137%) occur in pyrite, and the coefficient of accumulation in the different samples varies between 8.2 and 61.4 (average 35.8). The concentrations and coefficients of accumulation of these metals are much lower in pyrite and iron sulfides of Neoeuxinic deposits than in those of recent deep-sea sediments. (Josefson-USGS)
W73-11409

CONDITIONS OF PRESERVATION OF CHLOROPHYLL, PHEOPHYTIN, AND HUMIC SUBSTANCES IN BLACK SEA SEDIMENTS (USLOVIYA SOKHRANNOSTI KHLOROFILLA, FEOFITINA I GUMINOVYKH VESHCHESTV V OTLOZHENIYAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
T. V. Drozdova, and Yu. N. Gurskiy.
Geokhimiya, No 3, p 323-334, March 1972. 1 fig, 3 tab, 24 ref.

Descriptors: *Sediments, *Geochemistry, *Organic matter, *Humic acids, *Chlorophyll, Pigments, Sedimentation, Sedimentation rates, Diagenesis, Facies (Sedimentary), Chemical reactions, Oxidation-reduction potential, Hydrogen sulfide, Sampling, Cores, Analytical techniques.
Identifiers: USSR, *Black Sea, *Pheophytin, Organic carbon, Sapropel.

Distribution of organic matter and its components (chlorophyll, pheophytin, and humic acids) was investigated in different facies of Black Sea sediments. Samples collected from the surface of sediments and from cores up to 3.5 m in length were taken at depths ranging from 20 to 2,140 m. Chlorophyll and pheophytin were separated by paper chromatography and determined spectrophotometrically before and after oxidation of chlorophyll. A direct relation is observed between organic carbon and the contents of humic acids and chlorophyll-like pigments in all samples. Maximum concentrations of organic carbon (up to 20%), humic acids (up to 2.5%), and pigments (up to 0.1%) were found in sapropel of paleoeuxinic sediments. Considerably smaller amounts of these compounds were found in neoeuxinic sediments and in shelf sediments laid down in oxygenated water. High concentrations of chlorophyll and pheophytin were observed in paleoeuxinic sediments. Accumulation and preservation of chlorophyll, pheophytin, and humic acids in Black Sea sediments depend on oxidation-reduction conditions in the water and bottom sediments, character of the sedimentary facies, lithology and particle-size distribution of the sediments, and the sedimentation rate. (Josefson-USGS)
W73-11411

THE CLASSIFICATION OF ARID ZONE SOILS: I. AN APPROACH TO THE CLASSIFICATION OF ARID ZONE SOILS USING DEPOSITIONAL FEATURES,
Hunting Technical Services Ltd., Boreham Wood (England).
For primary bibliographic entry see Field 02G.
W73-11417

MAJOR AND TRACE ELEMENT LOADING OF CENTRAL MICHIGAN LAKES,
Michigan State Univ., East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-11427

ECOLOGICAL MONITORING OF TWO BEACH NOURISHMENT PROJECTS IN BROWARD COUNTY, FLORIDA,
Florida Atlantic Univ., Boca Raton. Dept. of Zoology.
W. R. Courtenay, Jr., D. J. Herrema, M. J. Thompson, W. P. Azzinaro, and J. Van Montfrans.
Shore and Beach, Vol 40, No 2, p 9-13, October 1972. 6 fig, 6 ref.

Descriptors: *Beach erosion, *Ecology, *Coastal engineering, *Dredging, *Monitoring, Excavation, Sedimentation, Shores, Benthos.
Identifiers: Beach protection.

Surveys of biological communities within any area proposed for dredging and filling or beach nourishment and restoration should be included in every such project proposal. These surveys should be conducted by both competent biologists and engineering surveyors working as a team prior to any dredging activities. A report should result from these investigations which is submitted to the agency contracting the project, the agency approving the project, the engineering-surveying-design group, the dredging firm, and any public agency requiring a statement of environmental impact of the proposed project. Ecological monitoring should be conducted during and after every such project by both biologists and engineers, again working as a team, to advise the dredging firm on protection of reef areas by taking advantage of adequate borrow areas, to prevent direct physical destruction of reef areas, and to assure that the initial recommendations of the survey team were carried out to the best advantage for protection of natural resources and completion of the project. In no case should dredging equipment be used in such projects which, by their design, contribute to unnecessary increases in turbidity and subsequent sediment fallout. The objective is to put the fill on the beach and not at the expense of natural nearshore and offshore resources. With proper planning and monitoring, both objectives can be met. (Knapp-USGS)
W73-11528

SCOUR AND FILL IN TUJUNGA WASH--A FANHEAD VALLEY IN URBAN SOUTHERN CALIFORNIA--1969,
Geological Survey, Washington, D.C.
K. M. Scott.
Available from GPO, Washington, D.C. 20402 Price $0.70. Geological Survey Professional Paper 732-B, 1973. 29 p, 16 fig, 1 tab, 18 ref.

Descriptors: *Scour, *Sedimentation, *Alluvial fans, *Urban hydrology, *California, Alluvial channels, Erosion, Deposition (Sediments), Degradation (Stream), Aggradation, Graded, Floods, Urbanization.
Identifiers: *Tujunga Wash (Calif).

In Tujunga Wash in southern California, extensive scour and fill occurred during the recordbreaking 1969 floods in this 3-mile-long, partly urbanized fanhead valley. Maximums of 20 feet of net scour and 35 feet of net fill were measured. The causes of the scour and fill were (1) the unexpected yet possibly natural diversion of floodflow to a major distributary channel of the wash in which urbanization had progressed, (2) local reduction in base level which occurred when floodflow in both of the main distributary channels entered a large gravel pit, and (3) lateral scour of an aggradational surface within the wash because of natural adjustment of a distributary channel to flood discharge. Additional scour and fill were due to locally raised base level and to the natural lateral shift characteristic of channels in the broad, ephemeral washes of arid and semiarid regions. Damage at most, if not all, localities could be directly ascribed to man's disregard of natural geomorphic processes on alluvial fans and in fanhead valleys. Urban development on the unstabilized cutbank of a natural flood channel on an alluvial fan or fanhead valley is generally a poor risk. (Knapp-USGS)
W73-11550

FALLING-DROP TECHNIQUE FOR SILT-CLAY SEDIMENT ANALYSIS,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 05A.
W73-11558

SEDIMENT RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).

June 1972. 248 p.

Descriptors: *Sediment transport, *Turbidity, *Australia, *River basins, Data collections, Suspended solids, Sediment yield, Sediment discharge, Particle size, Sampling, Reservoirs, Bed load, Hydrologic data, Streamflow, Runoff, Vegetation, Geology, Aerial photography, Mountains.
Identifiers: *Snowy Mountains Region (Australia).

All the records are presented of suspended sediment concentration and turbidity collected by the Snowy Mountains Hydro-electric Authority in the Snowy Mountains and adjacent regions of southeastern Australia during the period 1954 to June 1969. Similar records collected by the Snowy Mountains Council, the organization responsible for the operation of the Snowy Mountains Scheme, from July 1969 to December 1971, also are included. The publication is divided into two parts: Part A contains explanatory notes on the records, and Part B contains the records within the Murrumbidgee River basin. Upper Murray River basin, and Snowy River basin. Summaries are given of the records in each basin. (Woodard-USGS)
W73-11572

NUMERICAL TECHNIQUES APPLIED TO PARTICLE DEPOSITION DURING SLOT FLOW,
Howard Univ., Washington, D.C. Dept. of Chemical Engineering.
T. W. Copenhaver, P. B. Deshpande, and R. E. Babcock.
Water Resources Bulletin, Vol 9, No 3, p 556-566, June 1973. 10 fig, 6 ref. OWRR B-004-ARK (5).

Descriptors: *Sedimentation, *Injection wells, *Numerical analysis, *Waste disposal wells, *Hydrofracturing, Sediment transport, Mathematical models, Underground waste disposal, Deposition (Sediments), Vixcosity, Particle size.

The process of particle sedimentation from a fluid-solid slurry while flowing through a vertical slot was studied using a mathematical model. The differential equations describing the process consist of a 1st order, nonlinear, partial differential equation and a 1st order, ordinary differential equation. These two equations are solved using a forward difference technique. Results for typical sets of system parameters are presented and discussed. The model has practical applications in solid-waste disposal processes and in petroleum reservoir stimulation processes. The deposited particles quickly form a trapezoidal-shaped bank. This bank then builds essentially upward, not longitudinally, until the equilibrium height of the bank is reached. At this time, the bank exists essentially as a rectangle. Continued injection causes the bank to grow longitudinally creating a right trapezoid with its axis horizontal instead of vertical. The longitudinal point at which the bank quits building upward and begins to build longitudinally has been designated as the 'pinch point.' This point represents the carrying capacity of the slurry because it is at this point that the concentration of particles of the leading slurry front becomes zero due to deposition. The slope of the concentration versus length profile appears to be linear up to this point. Small particle diameters, high viscosity, and high injection rates cause the pinch point to occur at a point far removed from the injection point. Large particle diameters, low viscosity, and small injection rates cause the pinch point to occur near the injection point. (Knapp-USGS)
W73-11697

EFFECTS OF ROADWAY AND POND CONSTRUCTION ON SEDIMENT YIELD NEAR HARRISBURG, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
L. A. Reed.
Geological Survey open-file report, August 1971. 14 p, 7 fig, 4 ref.

Descriptors: *Sediment yield, *Road construction, *Ponds, *Pennsylvania, *Sediment transport, Streams, Environmental effects, Sedimentation rates, Land development, Correlation analysis, Engineering structures, Excavation, Erosion.
Identifiers: *Harrisburg area (Penn).

The effects are shown which the construction of half a mile of one-lane roadway during June-August 1970 and construction of a 5-acre pond during August and September 1970 had on sediment concentrations and sediment discharge of a stream draining an area of 0.76 square mile near Harrisburg, Pennsylvania. The effects of the construction are shown by comparing the data collected from the affected basin with data collected from a similar adjacent basin, unaffected by construction. During the pond construction, base-flow sediment concentrations increased from 6 mg/liter to an average of 35 mg/liter. Sediment discharge during June through December 1970 attributable to the construction was 55 tons, two-thirds of the amount normally expected during a year. (Woodard-USGS)
W73-11700

2K. Chemical Processes

THE THERMAL CONDUCTIVITY OF PURE WATER AND STANDARD SEA WATER AS A FUNCTION OF PRESSURE AND TEMPERATURE: PART II--PURE WATER,
Naval Ship Research and Development Center, Bethesda, Md.
V. J. Castelli, and E. M. Stanley.
Available from NTIS Springfield, Va 22151 AD-751 025 Price $3.00 printed copy; $0.95 microfiche. Report 3566-II, October 1972. 8 p, 5 fig, 5 tab, 11 ref.

Descriptors: Thermal conductivity, *Bodies of water, *Water temperature, *Water pressure, Correlation analysis, Analytical techniques, Measurement, Methodology, Data collections, Research equipment.
Identifiers: Pure water.

Observations were made of the thermal conductivity of pure water for the pressure range of atmospheric to 1400 bars and temperatures from 0 deg to 30 deg C. Two distinct series of measurements were conducted by utilizing different thermocouple junctions. Each series consisted of at least three determinations of each data point and many determinations of selected reference data points, primarily at 10 and 25 bars pressure. In almost all cases, the data resulting from any particular series agreed to within 0.2% of the mean value. Direct comparison of the data are tabulated. (Woodard-USGS)
W73-11084

WATER RESOURCES DATA FOR ALABAMA, 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, University, Ala.

Basic-data report, 1970. 94 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Water quality, *Surface waters, *Alabama, *Chemical analysis, Basic data collections, Streams, Streamflow, Flow rates, Sediment transport, Particle size, Sediment yield, Water temperature, Sampling.
Identifiers: *Water quality records (Ala).

Water quality data are presented for surface waters in Alabama for the 1970 water year. Data for a few water quality stations in bordering States are also included. Water quality information is presented for chemical quality, fluvial sediment, and water temperaztures. The chemical quality includes concentrations of individual dissolved constituents and certain properties or characteristics such as hardness, sodium-absorption-ratio, specific conductance, and pH. Fluvial sediment information is given for suspended-sediment discharges and concentrations and for particle-size distribution of suspended sediment and bed material. Water temperature data represent once-daily observations except for stations where a continuous temperature recorder furnishes information from which daily minimums and maximums are obtained. (Woodard-USGS)
W73-11085

SPECTRA OF TURBULENT FLUCTUATIONS OVER OCEAN WAVES,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 02B.
W73-11087

TRITIUM CONCENTRATION OF A VARIETY OF WATER SAMPLES: FIFTH LISTING,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 05B.
W73-11104

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY : APPENDIX H, MINERALS.
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-11107

CHARACTERISTICS AND ENVIRONMENTAL QUALITY OF SIX NORTH SHORE BAYS, NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
State Univ. of New York, Stony Brook. Marine Science Research Center.
M. G. Gross, D. Davies, P. M. Lin, and W. Loeffler.
Technical Report Series No 14, January 1972. 98 p, 21 fig, 20 tab, 30 ref, append.

Descriptors: *Water quality, *Bays, *New York, Environmental effects, Chemical properties, Physical properties, Surveys, Sampling, Data collections, Regression analysis, Correlation analysis, Evaluation, Classification, Ecology, Dissolved oxygen, Sediments, Drainage area, Inflow, Geology, Climate, Tidal effects, Storms, Water circulation.
Identifiers: Hempstead Harbor (N Y), Huntington Harbor (N Y), Little Neck Bay (N Y), Mt. Sinai Harbor (N Y), Port Jefferson Harbor (N Y).

Environmental studies of six bays on the north shore of Long Island provide data needed for long-range planning. Three environmental quality indicators were developed: present indicators, integrative indicators, and predictive indicators. Present indicators are based on data from the survey of water quality (e.g. dissolved oxygen). Integrative indicators are based on data from the survey of bottom deposits (e.g. loss on ignition). Predictive indicators are based on a number of factors: basic characteristics of the north shore bays (e.g. regional setting, drainage basins, geology, climate, tides, water circulation, storms); present water quality; and past water quality trends. By combining knowledge of present conditions and past trends with probable future processes, predictive indicators can be formulated. Based on present indicators the bays and harbors are ranked: (1) Manhasset Bay (worst); (2) Hempstead

Harbor; (3) Huntington Harbor; (4) Port Jefferson Harbor; (5) Little Neck Bay; and (6) Mt. Sinai Harbor (best). Based on integrative indicators the bays and harbors are ranked: (1) Manhasset Bay (worst); (2) Huntington Harbor; (3) Hempstead Harbor; (4) Little Neck Bay; (5) Port Jefferson Harbor, and; (6) Mt. Sinai Harbor (best). Based on predictive indicators the bays and harbors are ranked: (1) Huntington Harbor (worst); (2) Manhasset Bay; (3) Hempstead Harbor; (4) Mt. Sinai Harbor; (5) Port Jefferson Harbor; and (6) Little Neck Bay (best). (See also W73-11109) (Woodard-USGS)
W73-11108

SURVEY OF WATER QUALITY AND SEDIMENTS IN SIX NORTH SHORE BAYS, NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK (APPENDIX TO TECHNICAL REPORT NO. 14),
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross, D. Davies, P. M. Lin, and W. Loeffler.
Technical Report Series No 15, February 1972. 29 p, 16 fig, 4 tab, 6 ref.

Descriptors: *Water quality, *Bays, *New York, Chemical properties, Physical properties, Data collections, Sampling, Boats, Water analysis, Sediments, Chemical analysis, Analytical techniques.
Identifiers: Hempstead Harbor (N Y), Huntington Harbor (N Y), Little Neck Bay (N Y), Mt. Sinai Harbor (N Y), Port Jefferson Harbor (N Y).

This appendix presents water quality and sediment data collected in Little Neck Bay, Manhasset Bay, Hempstead Harbor, Huntington Harbor, Port Jefferson Harbor, and Mt. Sinai Harbor, New York, during the period May-December, 1971. The Surveys, sponsored by the Nassau-Suffolk Regional Planning Board, were part of a project designed to establish physical and chemical criteria for assessment of environmental quality in the bays (MSRC Technical Report Series No. 14, Gross et al, 1972). Presented are the sampling procedures and analytical techniques used in the surveys. The cruises are outlined in tables. Figures indicative of the entire body of data (which is stored at the Marine Sciences Research Center) are presented. (See also W73-11108) (Woodard-USGS)
W73-11109

WATER QUALITY INVESTIGATIONS: SOURIS RIVER BASIN, NORTH DAKOTA, 1969,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 05B.
W73-11115

SURVEY OF APPLICATION OF RADIATION TO PREPARATIVE CHEMISTRY,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
W. H. Philipp.
Available from NTIS, Springfield, Va 22151 as NASA TN D-7285, Price $3.00 printed copy; $0.95 microfiche. Note TN D-7285, May 1973. 32 p, 5 tab, 54 ref.

Descriptors: *Radiation, *Chemical reactions, *Aqueous solutions, Synthesis, Metals, Methodology, Oxidation, Reduction (Chemical), Ionization, Irradiation, Inorganic compounds, Organic compounds, Solvents.
Identifiers: Synthetic chemical compounds.

The use of radiation for preparative chemistry in liquid solutions is outlined. General principles are presented, and preparations involving reduction, oxidation, polymerization, and decomposition are given. The use of various solvents, water, inorganic liquids, and organic liquids, is discussed. Finally, a commentary is made on some specific applications where radiation chemistry as a preparative technique may be useful. Much of the discussion is based on extrapolation of existing radiochemical data which entails some speculation. At present, the use of radiation for this purpose is limited to the preparation of laboratory quantities of high purity materials and to the synthesis of compounds that cannot be readily prepared by ordinary chemical means. An exception is when chain or autocatalytic processes are involved which result in high energy yields of product; in this case, radiation may be used for larger production. (Woodard-USGS)
W73-11119

VOLUMETRIC DETERMINATION OF NICKEL BY HIGH FREQUENCY IMPEDIMETRY,
Consejo Superior de Investigaciones Cientificas, Santiago (Spain). Departamento de Quimica Analitica.
For primary bibliographic entry see Field 05A.
W73-11127

ALPHA-AL203 AS AN ADSORBENT IN THIN--LAYER CHROMATOGRAPHY,
Silesian Univ., Katowice (Poland). Inst. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-11128

INFLUENCE OF WEATHERING ON EFFECTIVE VALUES OF SHEAR STRENGTH OF MIOCENE CLAY,
J. Herstus.
In: Proceedings of the 4th Budapest Conference on Soil Mechanics and Foundation Engineering, A. Kezdi, editor, October 12-15, 1971, Hungary: Academiai Kiado, Budapest, p 135-142, 1971. 4 fig, 3 tab, 9 ref.

Descriptors: *Weathering, *Soil strength, *Clays, *Consolidation, Shear, Porosity, Leaching, Plasticity, Liquid limits, Mineralogy, Clay minerals, Compressive strength, Soil structure.
Identifiers: *Bohemia (Czechoslovakia).

In miocene clays from Northwest Bohemia there are four weathering zones. Analysis of the behavior in shear strength tests of clays from individual weathering zones supplemented by microscopic study of the structures demonstrates that weathering breaks up the original structures into individual aggregates of clay particles and produces fairly large pores. In weathering zone III the aggregates have been subsequently sealed with hydroxides of iron, and the behavior of the originally overconsolidated soil approximates the behavior of soils with metastable structure. Further intensive weathering in zone IV distrubs the diagenetic bonds produced by the hydroxides, and the clay behaves here like a normally consolidated or slightly overconsolidated soil. (Knapp-USGS)
W73-11196

WATER SAMPLING GUIDELINES AND INTERPRETATION OF DATA,
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 07A.
W73-11205

SIMULTANEOUS TRANSPORT OF CHLORIDE AND WATER DURING INFILTRATION,
California Univ., Davis. Dept. of Water Science and Engineering.
C. Kirda, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 37, No 3, p 339-345, May-June 1973. 7 fig, 1 tab, 27 ref.

Descriptors: *Leaching, *Diffusion, *Chlorides, *Infiltration, Mass transfer, Convection, Dispersion, Path of pollutants, Mixing, Soil water movement, Water chemistry, Tracers, Tracking techniques, Radioisotopes.
Identifiers: Chloride transport.

Displacement of chloride during infiltration was studied using soil columns for two cases: chloride initially spread on the soil surface; and chloride initially mixed with the soil. Chloride was applied as CaC12 labeled with C1-36. In conjunction with chloride activity measurement, gamma-ray attenuation measurement was used for monitoring the water content distribution during the simultaneous flow of chloride and water. Treatments included different levels of initial soil water content and different levels of water saturation at the soil surface during infiltration. The equations describing vertical water flow and miscible displacement of chloride were solved numerically. Experimental and calculated chloride distributions were in agreement. Chloride apparent diffusion coefficients estimated for pore water velocities less than 0.01 cm per min were nearly equal to those for molecular diffusion only. Initial soil water content did not influence the depth of chloride displacement for a given quantity of water infiltrated. Keeping the water content at the soil surface below saturation resulted in a deeper and more complete displacement of chloride. (Knapp-USGS)
W73-11213

WATER RESOURCES OF HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-11222

WATER ANALYSIS,
Geological Survey, Lakewood, Colo.
M. J. Fishman, and D. E. Erdmann.
Analytical Chemistry, Vol 45, No 5, p 361R-403R, April 1973. 630 ref.

Descriptors: *Metals, *Analytical techniques, *Water analysis, Analysis, Trace elements, Heavy metals, Alkali metals, Mercury, Lead, Cadmium, Gold, Silver, Nickel, Chemical analysis, Separation techniques, Sampling, Spectrophotometry, Gas chromatography, Detergents, Chromatography, Laboratory equipment, Halides, *Reviews, *Bibliographies.
Identifiers: *Atomic absorption spectroscopy.

This biennial review of methods of water analysis covers the literature from October 1970 through September 1972. Over six hundred references from major journals in the world are cited. Recent developments in the following analyses are included: alkali metals; hardness, alkaline earth metals; aluminum, iron, manganese, chromium, rhenium, cerium, and titanium; copper, zinc, lead, cadmium, nickel, cobalt, and tin; mercury, silver and gold; vanadium, molybdenium, scandium, antimony, bismuth, uranium, and rare earths; selenium, boron, arsenic, phosphorus, and silica; and halides. Organics, sulfur and nitrogen compounds, oxygen parameters, detergents and miscellaneous determinations are covered in more detail. (Oleszkiewicz - Vanderbilt)
W73-11285

THE USE OF ATOMIC ABSORPTION FOR ANALYSIS OF NATURAL WATERS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W73-11291

ATOMIC ABSORPTION SPECTROPHOTOMETRY AS A TOOL FOR THE WATER CHEMIST,
Calgon Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05A.
W73-11294

DETERMINATION OF TOTAL CHROMIUM IN FRESH WATERS BY ATOMIC ABSORPTION,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W73-11295

DETERMINATION OF TRACE MERCURY IN SOIL AND ROCK MEDIA,
Colorado School of Mines, Golden. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-11297

ATOMIC ABSORPTION SPECTROPHOTOMETRY IN THE FIELD OF MARINE RESEARCH,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05A.
W73-11298

THE CHANGING CHEMISTRY OF THE OCEANS.
For primary bibliographic entry see Field 05B.
W73-11367

NITROUS OXIDE IN AIR AND SEA WATER OVER THE ATLANTIC OCEAN,
Max-Planck-Institut fuer Chemie, Mainz (West Germany).
For primary bibliographic entry see Field 05B.
W73-11370

IMPACT OF NATURAL AND MAN-MADE SURFACE FILMS ON THE PROPERTIES OF THE AIR-SEA INTERFACE,
Naval Research Lab., Washington, D.C. Ocean Science Div.
For primary bibliographic entry see Field 05B.
W73-11371

SOME ASPECTS OF THE GEOCHEMISTRY OF MARINE AEROSOLS,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
R. Chesselet, J. Morelli, and P. B. Menard.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 93-114, 1972. 13 fig, 3 tab, 71 ref.

Descriptors: *Aerosols, *Water chemistry, *Sea water, *Sea spray, Sodium, Chlorides, Hydrologic cycle, Potassium, Magnesium, Calcium.
Identifiers: *Marine aerosols.

A considerable proportion of the salts dissolved in rivers has a marine origin. These salts arise from the injection of particles into the atmosphere at the surface of the oceans; they fall out, subsequently, onto the continents, and are then carried back to the oceans by rivers. The relative proportions of the principal ionic constituents in seawater are never found in the atmosphere or in precipitations. The weight ratios between chlorine, sodium, potassium, and calcium seem to reflect an enrichment process for potassium and calcium, with respect to sodium. The source of gaseous chlorine in the atmosphere is the release above the ocean of gaseous chlorine, probably as HCl, at the expense of particulate chlorine. Concentrations of gaseous chlorine of marine origin above the lands seem to be controlled by a slow combination of this chlorine with the terrigenous environment. This loss balances a supply of oceanic gaseous chlorine of about 200 million tons per year. (See also W73-11367) (Knapp-USGS)
W73-11372

THE ROLE OF THE OCEANS AND BIOSPHERE IN THE CARBON DIOXIDE CYCLE,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
L. Machta.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 121-145, 1972. 7 fig, 8 tab, 12 ref, append.

Descriptors: *Carbon dioxide, *Water chemistry, *Climatology, *Carbon cycle, Sea water, Tracers, Carbon radioisotopes, Carbonates, Oceans.
Identifiers: *Carbon dioxide cycle.

Carbon dioxide plays a role in the radiation budget of the atmosphere. The fluctuations of this gas, due either to natural or manmade causes, must be predicted and understood before forecasts of climate modification can be undertaken. The three reservoirs through which carbon exchanges are the atmosphere, the biosphere, and the oceans. Prediction of atmospheric carbon dioxide depends on the input of carbon dioxide from the combustion of fossil fuels, the exchange between reservoirs, the exchanges within parts of each reservoir, and the stability of each reservoir. Despite uncertainties in the true seasonal variation of biospheric uptake and release of carbon dioxide to the atmosphere, the biosphere is dominant in seasonal variation. The oceans have a smaller effect even in the southern hemisphere with its large water area. In fact, the oceans, if important for this purpose, would produce the opposite changes in atmospheric carbon dioxide from those observed, because of seasonal temperature variations. The reasons for the lesser role of the oceans may be slow response time to temperature changes and the compensating effects of the marine biosphere. (See also W73-11367) (Knapp-USGS)
W73-11373

THE CHEMICAL STABILITY OF THE OCEANS AND THE CO2 SYSTEM,
Oregon State Univ., Corvallis. Dept. of Oceanography.
R. M. Pytkowicz.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 147-152, 1972. 2 fig, 8 ref. NSF Grant GA-17011.

Descriptors: *Water chemistry, *Sea water, *Equilibrium, *Kinetics, Carbon dioxide, Hydrogen ion concentration, Chemical reactions, Chemical potential.
Identifiers: *Steady-state chemistry.

As an alternative mechanism to equilibrium for chemical stability of ocean water, the steady state is reasonable in stationary open systems with gradients of chemical potential. Equilibria and steady states may coexist in the oceans. Steady states require only that the net input and output rates of reservoirs be equal and are, therefore, less restrictive than equilibria for which the net rates must be zero. Simple first order models are used to deduce the general conditions which lead to an equilibrium or to a steady state ocean and to suggest more complex models and the types of data needed to treat geochemical systems quantitatively. A steady state ocean will occur in chemical systems in which the weathering reservoir on land is not seriously depleted within the time scale of interest, whether the systems in the oceans are controlled by biological or by mineral equilibration processes. Dissolved $CaCO_3$ is not at equilibrium with the solid phase, and the removal of alkalinity is biogenic. Therefore, the alkalinity of the oceans appears to be in steady state. The pCO_2 of seawater below the thin wind mixed layer is controlled by oxidation rather than by near equilibrium with the atmosphere. The pH is determined by any two relevant quantities. Thus, if the alkalinity and the pCO_2 of seawater are at a steady state controlled by life processes, then so is the pH. (See also W73-11367) (Knapp-USGS)
W73-11374

MICROBIAL ACTIVITY AS A BIOGEOCHEMICAL FACTOR IN THE OCEAN,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05B.
W73-11378

ON THE AGE OF STABLE ORGANIC MATTER--AQUATIC HUMUS IN OCEANIC WATERS,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05B.
W73-11379

CHEMICAL CYCLES WITH ENERGY CIRCUIT MODELS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 02A.
W73-11381

GEOLOGICAL, GEOCHEMICAL AND ENVIRONMENTAL IMPLICATIONS OF THE MARINE DUST VEIL,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-11383

MANGANESE NODULES AND BUDGET OF TRACE SOLUBLES IN OCEANS,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 05B.
W73-11384

SULFATE REDUCTION, PYRITE FORMATION, AND THE OCEANIC SULFUR BUDGET,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-11386

CALCITE SATURATION IN AN EASTERN KENTUCKY KARST STREAM,
Kentucky Univ., Lexington. Dept. of Geology.
D. P. Beiter.
M Sc Thesis, 1970. 75 p, 12 fig, 6 tab, 5 append. OWRR A-009-KY (3).

Descriptors: *Limestones, *Sedimentary rocks, *Calcite, *Kentucky, Water quality, *Groundwater, Caves, Streams, Sampling, Water Chemistry, Chemical analysis, Karst, Dissolved solids, Analytical techniques.
Identifiers: Dissolved calcite.

Meteoric water entering a body of limestone is capable of dissolving appreciable amounts of rock over long periods of time. Since in many limestone bodies, the only available water supply is from openings produced by solution, it is of interest to know the location and rate of such solution. One approach is to determine the capability of the water at any point to further dissolve calcite, the main constituent of limestone. Cave Hollow is a

hanging karst valley in Lee County, Kentucky, approximately halfway between Irvine and Beattyville. The caves of the Cave Hollow System are excavated in Mississippian limestone which is overlain by Pennsylvanian shales and sandstones, and underlain by Mississippian siltstones and shales. The entire valley is about 2.6 km long and 1.2 km wide and is floored by the limestone. Local relief is about 150 m. Streams heading on the Pennsylvanian clastics flow towards the limestone and sink near the contact. All water emerges from a spring near the mouth of the valley. Samples were collected at various points of the Cave Hollow System between March and December 1968. Two types of conclusions were made from the study. First are those concerning the chemistry of the system. Second are those concerning the methods and the directions of needed future inquiry. (Woodard-USGS)
W73-11391

WATER RECORDS OF THE U.S. VIRGIN ISLANDS, 1962-69,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W73-11396

GROUND-WATER BASIC DATA OF CAVALIER AND PEMBINA COUNTIES,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 04B.
W73-11397

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-11399

ROLE OF IRON SULFIDES IN THE ACCUMULATION OF TRACE ELEMENTS IN BLACK SEA SEDIMENTS (ROL' SUL'FIDOV ZHELEZA PRI NAKOPLENII MIKROELEMENTOV V OSADKAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-11409

SOME PROBLEMS IN THE GEOCHEMISTRY OF MOLYBDENUM IN THE MEDITERRANEAN SEA (NEKOTORYYE VOPROSY GEOKHIMII MOLIBDENA V SREDIZEMNOM MORE),
Akademiya Nauk SSSR, Gelendzhik. Institut Okeanologii.
M. F. Pilipchuk.
Litologiya i Poleznyye Iskopayemyye, No 2, p 25-31, March-April 1972. 3 fig, 2 tab, 17 ref.

Descriptors: *Geochemistry, *Sea water, *Molybdenum, Trace elements, Metals, Sediments, Silts, Organic matter, Inorganic compounds, Pyrite, Chemical reactions, Analytical techniques, Sampling, Cores.
Identifiers: USSR, *Mediterranean Sea, Sea of Marmara, Organic carbon, Vanadium, Tungsten.

The Mo content in the eastern part of the Mediterranean Sea is high, amounting to 10.9-17.7 micrograms of Mo03/liter. The vertical distribution of Mo in the sea water is uniform and is typical of other normally aerated basins. In the Sea of Marmara, the slight decrease in Mo concentration in the surface layer is due to the influence of fresh Black Sea waters, and the Mo03 concentration in the sediments varies between 0.00019% and 0.0080%. In sediments with an oxygen regime, maximum Mo concentrations are confined to layers rich in manganese hydroxide. There is a clear correlation between Mo and organic carbon in the reduced sediments. (Josefson-USGS)
W73-11410

CONDITIONS OF PRESERVATION OF CHLOROPHYLL, PHEOPHYTIN, AND HUMIC SUBSTANCES IN BLACK SEA SEDIMENTS (USLOVIYA SOKHRANNOSTI KHLOROFILLA, FEOFITINA I GUMINOVYKH VESHCHESTV V OTLOZHENIYAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 02J.
W73-11411

DISTRIBUTION AND COMPOSITION OF MINERAL WATER IN THE TUVA AUTONOMOUS REPUBLIC (ZAKONOMERNOSTI RASPROSTRANENIYA I SOSTAV PODZEMNYKH MINERAL'NYKH VOD TUVY),
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 02F.
W73-11412

DISTRIBUTION OF TRACE ELEMENTS IN BODIES OF WATER OF KAZAKHSTAN (RASPREDELENIYE MIKROELEMENTOV V VODOYEMAKH KAZAKHSTANA),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Khimicheskikh Nauk.
A. I. Mun, and A. B. Bekturov.
Izdatel'stvo 'Nauka' Kazakhskoy SSR, Alma-Ata, 1971. 290 p.

Descriptors: *Geochemistry, *Trace elements, Bodies of water, *Lakes, Saline lakes, Rivers, Springs, Groundwater, Freshwater, Lake sediments, Bottom sediments, Halogens, Metals, Boron, Brines, Salinity, Ions, Humic acids, Water chemistry, Water sampling.
Identifiers: *USSR (Kazakhstan), Lithium, Rubidium, Oozes, Sapropel.

Data are presented on the distribution of trace elements in waters and bottom sediments of lakes in Kazakhstan. The trace elements examined are I, Br, F, B, Li, K, Rb, Cs, Co, Ni, Cu, and Zn. Brines and surface waters in northern, central and southeastern regions of the Republic are described, and attention is given to the use of certain trace elements as indicators of the salinity of water bodies. (Josefson-USGS)
W73-11413

GROUND-WATER QUALITY IN WISCONSIN THROUGH 1972,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 02F.
W73-11568

2L. Estuaries

DIRECT DETERMINATION OF THE ELECTROMAGNETIC REFLECTION PROPERTIES OF SMOOTH BRACKISH WATER TO THE CONTINUOUS SPECTRUM FROM 100 MILLION TO 4 BILLION HERTZ,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. K. Lepley, and W. M. Adams.
Available from the National Technical Information Service as PB-221 372, $4.85 in paper copy, $0.95 in microfiche. Technical Report No 48, May 1971. 86 p, 36 fig, 50 ref, append. OWRR-B-015-HI (5).

Descriptors: *Remote sensing, Radio waves, Microwaves, *Brackish water, *Electromagnetic waves, *Salinity, Pollutants, Estuaries, *Hawaii, Springs, Roughness (Hydraulic), Reflectance, Radar, Waves, Chlorinity, Dispersion.

Computer-generated frequency dispersion curves were constructed of (1) the dielectric coefficients, (2) power reflectance, (3) brightness temperature, and (4) skin depth of water as a function of eight different normalities of sodium chloride corresponding to a salinity range from pure to ocean water, and as a function of five different temperatures from 0C to 40C to the radio frequency range from 1,000,000 to 3 x 10 to the 10th power Hertz. These graphs indicate that the frequency dispersion of the reflectance of radio energy in the 1,000,000 to 10 to the 9th power Hertz band at normal incidence to a smooth water surface is strongly influenced by the salinity of the water, and that the spectral signature could be used as a measure of water salinity as distinguished from water temperature. Reflectance spectra from 2.5 x 10 to the 9th power to 4.0 x 10 to the 9th power Hertz of fresh and sea water were obtained with a free-wave (horn antenna and pool) system and reflectance spectra of brackish and sea water from 10 to the 8th power to 2.0 x 10 to the 9th power Hertz and of fresh water from 0.8 x 10 to the 9th power to 2 x 10 to the 9th power Hertz were obtained with a coaxial waveguide system. The measured spectral signatures appear to agree with the computed reflectance of aqueous sodium chloride solutions. The theoretical and experimental results indicate that free-wave radio reflectance spectrometry from 1,000,000 to 10 to the 9th power Hertz is feasible for use in remote sensing of salinity of fresh and brackish water outflows onto sea water.
W73-11052

A CATALOG OF HYDROCLIMATOLOGICAL DATA FOR ALASKA'S COASTAL ZONE,
Alaska University, College. Inst. of Water Resources.
For primary bibliographic entry see Field 02B.
W73-11056

COASTAL DYNAMICS ALONG MUSTANG ISLAND, TEXAS,
Western Michigan Univ., Kalamazoo.
R. A. Davis, Jr., and W. T. Fox.
Available from NTIS, Springfield, Va. 22151 AD-750 756; Price $3.00 printed copy; $0.95 microfiche. Technical Report No 9, October 1, 1972. 68 p, 29 fig, 14 ref, append. ONR Contract N00014-69-C-0151.

Descriptors: *Hydrodynamics, *Coasts, *Islands, *Gulf of Mexico, *Texas, Beach erosion, Shores, Data collections, Shore protection, Topography, Winds, Velocity, Ocean waves, Currents (Water), Storms, Sand bars, Correlation analysis, Lake Michigan, Environmental effects, Time series analysis.
Identifiers: Mustang Island (Tex).

Two modified time-series studies were conducted along the Mustang Island, Texas coast during October-November, 1971 and January-February, 1972. Patterns exhibited by variations in monitored environmental variables show interrelationships that are quite comparable to those observed in eastern Lake Michigan. The dominating factor in controlling coastal processes along the Texas coast is barometric pressure. Large-scale fluctuations occur as cold fronts ('northers') move through the area in an offshore direction. Changes in wind direction and velocity, breaker height, and longshore current direction and velocity accompany the passage of these fronts. The responses of beach and nearshore topography to these changes are also much like those observed in Lake Michigan. High energy conditions created by the passage of fronts cause seaward displacement and planation of the sand bar, whereas quiescent conditions permit slow shoreward migration and buildup of the sand bar. Rip currents are commonly present and may cut channels in the sand bar; however, changes in bar location and form do not show the cyclic pattern observed in Lake Michigan. (Woodard-USGS)
W73-11081

A CASE HISTORY OF SANTA CRUZ HARBOR, CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 08B.
W73-11092

CHARACTERISTICS AND ENVIRONMENTAL QUALITY OF SIX NORTH SHORE BAYS, NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
State Univ. of New York, Stony Brook. Marine Science Research Center.
For primary bibliographic entry see Field 02K.
W73-11108

SURVEY OF WATER QUALITY AND SEDIMENTS IN SIX NORTH SHORE BAYS, NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK (APPENDIX TO TECHNICAL REPORT NO. 14),
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 02K.
W73-11109

HYDROGRAPHIC STUDY OF THE SHELF AND SLOPE WATERS OF NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 02E.
W73-11110

PHOSPHATE IN INTERSTITIAL WATERS OF ANOXIC SEDIMENTS: OXIDATION EFFECTS DURING SAMPLING PROCEDURE,
John Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 05B.
W73-11118

HYDRAULIC MODEL MEASUREMENTS OF TIDAL CURRENTS AROUND CAPE HENLOPEN, DELAWARE,
Delaware Univ., Newark, Coll. of Marine Studies.
B. T. Lakshman, and F. E. Camfield.
Available from NTIS, Springfield, Va 22151 AD-752 478; Price $3.00 printed copy; $0.95 microfiche. Technical Report No 15, July 1972. 79 p, 10 fig, 5 tab, 27 ref, append. ONR-GP Contract N00014-69-A0407.

Descriptors: *Deposition (Sediments), *Shoals, *Coasts, *Sediment transport, *Delaware, Model studies, Tidal effects, Channel morphology, Harbors, Correlation analysis, Ocean currents, Tides.
Identifiers: *Cape Henlopen (Del).

Cape Henlopen, Delaware, is advancing to the north and west at the rate of approximately 12 ft per year. A harbor developed in the Cape Henlopen area in the early 1800's has since shoaled with sediment moved by currents. A study was made to investigate the feasibility of using a hydraulic model for measuring tidal currents around Cape Henlopen. The model 4 ft x 4 1/2 ft reproduced an area of about 23.2 square miles. A rocking tray constructed for the study is described. A separate open channel experiment was conducted for simulating bottom roughness through friction elements. A comparative study between measured model currents and prototype currents shows that a small-scale distorted hydraulic model can be used for measuring tidal currents. The model measurements of tidal currents indicate the possible reasons for shoaling of Breakwater Harbor and the advance of Cape Henlopen. (Woodard-USGS)
W73-11203

VOLCANIC EXHALATIONS AND METAL ENRICHMENTS AT MATUPI HARBOR, NEW BRITAIN, T.P.N.G.,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Bass-Backing Geobiological Lab.
For primary bibliographic entry see Field 05B.
W73-11292

RESEARCH AND THE PROBLEMS OF TWO SEAS,
P. G. Sly.
In: Oceans Ontario. Technical Sessions. April 22, 1972, James Allister MacInnes Foundation, Toronto, Ontario, Canada. p 1-15, (1972).

Descriptors: *Bays, Hydrography, *Bathymetry, Temperature, *Salinity, *Mixing, *Diffusion, *Ice, Environmental effects, Exploitation, Oil industry, Mineral industry, Gases, Fish, Waste disposal, Dredging, Erosion, Landfills.
Identifiers: *James Bay, *Hudson Bay.

The physical conditions of the James and Hudson bays are described. Both bays are in good condition, warmer waters reflect seasonal warming in shallow areas, low salinities nearshore reflect river inflow, and oxygen levels are indicative of the mixing and diffusion expected from the bathymetry of the bays. Ice conditions were examined. The possible effects of the following are discussed: oil, gas, mineral, and fish exploitation; waste disposal; dredging; erosion; shore construction; fill operations; and thermal pollution. (Ensign-PAI)
W73-11350

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. V, JAMAICA BAY RAINSTORMS,
New York City-Rand Inst., N.Y.
For primary bibliographic entry see Field 05B.
W73-11351

THE CHANGING CHEMISTRY OF THE OCEANS.
For primary bibliographic entry see Field 05B.
W73-11367

A STUDY OF COASTAL WATER QUALITY IN THE VICINITY OF SAN JUAN, PUERTO RICO, JANUARY 13-31, 1971.
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05B.
W73-11388

THE USE OF MODERN CHROMIUM ACCUMULATIONS TO DETERMINE ESTUARINE SEDIMENTATION RATES,
New Hampshire Univ., Durham. Jackson Estuarine Lab.
J. M. Capuzzo, and F. E. Anderson.
Marine Geology, Vol 14, No 3, p 225-235, March 1973. 4 fig, 1 tab, 29 ref.

Descriptors: *Sedimentation rates, *Estuaries, *Chromium, *Tracers, *New Hampshire, Sedimentation, Sampling, Chemical analysis, Path of pollutants, Industrial wastes, Tannery wastes, Organic matter.
Identifiers: Great Bay estuary (NH).

To estimate the sedimentation rate and effect of chromium pollution in the Great Bay estuary of New Hampshire, cores were taken and analyzed for chromium content, size fractions, and combustible matter. These values were correlated to distinguish between natural and artificial or enhanced levels of chromium. The results indicate that chromium is accumulating in higher than natural levels in the upper reaches of the estuary and may be used as an indicator species to estimate sedimentation rates. (Knapp-USGS)
W73-11392

VOLUME TRANSPORT, SALINITY DISTRIBUTION AND NET CIRCULATION IN THE DUPLIN ESTUARY, GEORGIA,
Georgia Univ., Sapelo Island. Marine Inst.
B. Kjerfve.
Available from National Technical Information Service as PB-221 535, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology Report ERC-0273, April 1973, 30 p, 22 fig, 10 ref. OWRR B-035-GA (2), 14-01-0001-1892.

Descriptors: *Estuaries, *Salinity, Salt Marshes, *Georgia, *Water circulation, *Tidal waters, Saline water intrusion.
Identifiers: *Duplin River estuary (Geo.), Volume flow.

A field study during one tidal cycle in the Duplin River estuary, Georgia indicated a net up-river volume transport. It is thought that some of the Duplin water, which during high tides floods the surrounding marsh, drained off to nearby creeks when the tide falls. There is no apparent source of fresh-water along the river, yet the salinity distribution in a longitudinal section is found to decrease toward the head. The cause is believed to be ground water entering the river. Although the longitudinal net salt distribution matches the Chesapeake Bay estuaries, the lateral distribution is opposite. The time-averaged velocity data indicate a complex circulation. The longitudinal net flow at one cross section was two-layered in the middle but one- and three-layered along the eastern and western sides, respectively. (James-Georgia)
W73-11425

THE EFFECTS OF DITCHING ON THE MOSQUITO POPULATIONS IN SOME SECTIONS OF JUNCUS SALT MARSH IN CARTERET COUNTY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Entomology.
For primary bibliographic entry see Field 04A.
W73-11431

LIVING FORAMINIFERIDS OF TIDAL MARSHES: A REVIEW,
Bristol Univ. (England). Dept. of Geology.
J. W. Murray.
J Foraminiferal Res. Vol 1, No 4, p 153-161. 1971. Illus.
Identifiers: *Foraminiferids, Marshes, Miliolina, *Reviews, Rotalinia, Textulariina, *Tidal marshes.

Tidal marshes can be differentiated according to their water characteristics: hyposaline, normal marine, hypersaline. The living foraminiferid assemblages of all marshes have very low diversity. Hyposaline marshes have high Textularina, some Rotaliina and generally an absence of Miliolina. Normal marine and hypersaline marshes are characterized by the presence of all 3 suborders. The principal species are cosmopolitan. Marsh assemblages are readily separated from those of lagoons and shelf seas.--Copyright 1972, Biological Abstracts, Inc.
W73-11502

SEISMIC SEICHES IN BAYS, CHANNELS, AND ESTUARIES,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02H.
W73-11532

PLANT COMMUNITIES OF WET GROUND IN NORTHEAST CHESHIRE, ENGLAND,
Michigan State Univ., East Lansing. Dept. of Botany.
B. Moss.
Vegetatio. Vol 22, No 6, p 373-385. 1971. Illus.
Identifiers: Cardamine-Flexuosa-D, Deschampsia-Cespitosa-M, *England (Cheshire), Galium-Palustre-D, Holcus-Lanatus-M, *Juncus-Effusus-M, *Plant communities, Soils, Vegetation, Wet ground, *Marshes.

Areas of impeded drainage are dominated by Juncus effusus marshes usually with Cardamine flexuosa, Galium palustre, Holcus lanatus and Deschampsia cespitosa. Soils and vegetational history are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-11552

SAND MOVEMENT ALONG CARMEL RIVER STATE BEACH, CARMEL, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
B. F. Howell.
Available from NTIS, Springfield, Va. 22151 as AD-753 623, Price $3.00 printed copy; $0.95 microfiche. M Sc Thesis, September 1972. 67 p, 17 fig, 1 tab, 25 ref, 2 append.

Descriptors: *Sediment transport, *Beach erosion, *Littoral drift, *Bays, *California, Sediments, Sands, Particle size, Analytical techniques, Estuaries, Sedimentology, Coasts, Ocean waves, Tidal effects, River flow, Inflow.
Identifiers: *Carmel River State Beach (Calif).

The direction of sand movement along the Carmel River State Beach in California was qualitatively determined by diving observations, a bathymetric survey, wave refraction diagrams and a sediment size analysis of 18 samples. The primary source of sediments for the beach appears to be the Carmel River which flows only seasonally. Sedimentary material is introduced into the bay after winter precipitation provides a sufficient amount of runoff to warrent the opening of the river mouth by bulldozer. The fine sedimentary material is lost offshore and the coarser material is either redeposited on the beach or is carried south with the littoral drift and deposited at a nodal point in the sand transport pattern. This node is located on the northern edge of the head of the Carmel Submarine Canyon. Winter storms probably induce slumping or gravity sliding and much of the material is carried to deeper water by the canyon. (Woodard-USGS)
W73-11557

SAND TRANSPORT BY THE EEL RIVER AND ITS EFFECT ON NEARBY BEACHES,
Geological Survey, Menlo Park, Calif.
J. R. Ritter.
Geological Survey Water Resources open-file report, 1972. 17 p, 6 fig, 4 tab, 20 ref.

Descriptors: *Sediment transport, *Sands, *Sediment deposition, *Beaches, *California, Data collections, Estuaries, Rivers, Streamflow, Sediment yield, Discharge (Water), Sediments, Particle size.
Identifiers: *Eel River (Calif), Heavy minerals.

The Eel River basin in California has one of the largest sediment yields per unit area in the world. Sand composes about 25% of the total sediment transported by the river into its estuary. The annual sand load averages about 4,600,000 tons, equivalent to a deposition of about 2,100 acre-feet of sand per year. Most of this sand enters the ocean; some is deposited in the estuary. The amount furnished to nearby beaches is small. The major part of the sand and finer sediment debouched by the Eel River into the ocean is scattered over the continental margin, some is trapped by the Eel Canyon, and some is deposited offshore near the Eel River mouth. The Eel probably supplies most of the sand found along the beaches between Centerville Beach and the entrance to Humboldt Bay. The Mad and Little Rivers supply most of the sand found along the beaches between the entrance to Humboldt Bay and Moonstone Beach. Sand is defined as sediment having an intermediate diameter of 0.062-2.0 mm. Results provide an insight to the possible consequences to the coast if the sand being discharged by the Eel River is interrupted by works of man, such as a dam on its lower reaches or dredging operations at its mouth. (Woodard-USGS)
W73-11559

MEASUREMENT OF SALT-WEDGE EXCURSION DISTANCE IN THE DUWAMISH RIVER ESTUARY, SEATTLE, WASHINGTON, BY MEANS OF THE DISSOLVED-OXYGEN GRADIENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-11564

THE SEASONAL CYCLE OF VITAMIN B12 IN THE STRAIT OF GEORGIA, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
S. A. Cattell.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 215-222, February 1973. 2 fig, 3 tab, 29 ref.

Descriptors: *Bioassay, *Seasonal, *Cycling nutrients, *Phosphates, *Nitrates, *Distribution patterns, Nutrients, Vitamin B, Sampling, Water analysis, Nitrites, Depth, Salinity, Cultures, Growth rates, Water temperature, Marine algae, Pyrrophyta, Dinoflagellates, Phytoplankton, Estuarine environment.
Identifiers: *Vitamin B-12, *Amphidinium carteri, Strait of Georgia, Juan de Fuca Strait, Sample preparation, Particulate matter, Coulter counter.

Water samples were collected from four stations in the Strait of Georgia, British Columbia and one station in the waters connecting the Strait of Georgia and Juan de Fuca Strait over a period of 17 months for use in investigating the seasonal cycle of vitamin B12. Samples were filtered and frozen in polyethylene containers for analysis of phosphate, nitrate-nitrite nitrogen and vitamin B12. Salinity and temperature were also determined for each sample. Vitamin B12 was determined by bioassay using Amphidinium carterae. After culturing for 11 or 12 days, bioassay samples were diluted and counted on a Model B Coulter Counter. The final yield of cell numbers was found with control solutions to be linearly related to vitamin B12 concentrations of at least 10 mg/liter. The results show that monthly averages for B12 in the upper 10 m of the Strait of Georgia are similar in temporal distribution to those of the inorganic nutrients including a winter high followed by an early spring decrease and a slight peak in late spring. However, B12 showed a peak in the summer while inorganic nutrients were at minimal concentrations. Furthermore, inorganic nutrients tended to increase with depth and correlated with water density. B12, however, showed little correlation with this parameter, even with summer stratification. It is concluded that the temporal and spatial distribution of B12 in the Strait is more complex than that of nitrate and phosphate. It is hypothesized that the observed heterogeneity of B12 is largely a result of interactions of vitamin particulate matter. (Little-Battelle)
W73-11578

NUTRIENT INVERSIONS IN THE SOUTHEASTERN TROPICAL PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
W. H. Thomas.
Fishery Bulletin, Vol 70, No 3, p 929-932, 1972. 3 fig, 11 ref.

Descriptors: *Pacific Ocean, *Nitrates, *Phosphates, *Nitrites, *Silicates, Salinity, Depth, Phytoplankton, Chlorophyll, Water analysis, Sea water, Nutrients, Distribution patterns, Withdrawal.
Identifiers: *Nutrient inversion.

During a cruise of the Pacific Ocean in 1970, samples of seawater were collected at various depths in Nansen bottles for analysis of nitrates, nitrites, phosphates, and silicates. Plots of nutrient concentration versus depth showed that at a typical station nutrients such as nitrate and phosphate were high at the surface, at a minimum at about 100 m depth, and then increased at greater depths. Silicate followed this distribution to a lesser degree. These inversions occurred from lat 8 to 15 degrees S and were more pronounced in sections along long 126 degrees W and 119 degrees W than in sections farther east. The nutrient minimum was associated with water having a salinity maximum. It is suggested that such water may have acquired its characteristics in the mixed layer in areas to the south or southeast where the nutrients were depleted by phytoplankton, and had then sunk below high-nutrient and relatively fresh water carried westward from the Peru Current. However, the nutrients may also have been depleted in situ since the low-nutrient water contained a maximum amount of chlorophyll. (Little-Battelle)
W73-11587

OXYGEN DEFICIENT CONDITIONS AND NITRATE REDUCTION IN THE EASTERN TROPICAL NORTH PACIFIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W73-11589

PHYSICAL-CHEMICAL OCEANOGRAPHIC DATA FROM THE NORTH PACIFIC OCEAN AND BERING SEA, 1971,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 05A.
W73-11595

TROPHICAL ROLE OF BACTERIA IN THE ECOSYSTEM OF THE CORAL REEF,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-11632

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE MECHANISM OF FORMATION OF 'SKINNED' TYPE MEMBRANES AND THEIR CHARACTERIZATION,
Hydronautics, Inc., Laurel, Md.
M. A. Frommer, and R. Matz.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.25. Office of Saline Water Research and Development Progress Report No 774, May 1972. 125 p, 14 tab, 39 fig, 88 ref. 14-30-2529.

Descriptors: *Reverse osmosis, *Desalination, *Membranes, *Membrane processes.
Identifiers: *Cellulose acetate, Skinned membranes, Asymmetric membranes, Water flux, Salt rejection, Membrane formation, Membrane morphology, Membrane characterization.

This final technical report consists of a set of publications and preprints summarizing the most recent experimental observations not yet reported in the open scientific literature. Reflecting different aspects of the problems, these publications exhibit some diversity, and different degrees of refinement of approach. It is believed that these publications will make it possible to achieve a more meaningful and useful understanding of the complex phenomena involved in the preparation and characterization of skinned asymmetric membranes. The report describes an apparatus for studying the mechanism of skinned membrane formation, membrane structures and their relation to preparation conditions, and a theory of the mechanisms by which skinned membranes form. (OSW)
W73-11153

RESEARCH ON PIEZODIALYSIS, THIRD REPORT,
Ionics, Inc., Watertown, Mass.
F. B. Leitz, and J. Sharr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.75. Office of Saline Water Research and Development Progress Report No 775, May 1972. 80 p, 22 fig, 17 tab, 22 ref. 14-01-0001-2333.

Descriptors: *Desalination, *Membrane processes, *Dialysis, *Permselective membranes.
Identifiers: *Piezodialysis, *Charge-mosaic membranes, Ion-exchange resins.

Piezodialysis is a new and promising process for water desalination. In this process a concentrated salt solution passes through a membrane leaving a stream of reduced salinity. Based on irreversible thermodynamics, a mathematical description of the process has been obtained which, using the transport properties of the resins of which the membrane is composed, predicts the kind of performance which might be obtained. Strong coupling between the counterions and the gel water in the resins is required. Several ion-exchange resins have been developed which have adequate coupling between counterions and water. A variety of techniques have been investigated for using these resins in composite membranes, some of which have shown significant salt enrichments. A laboratory piezodialysis module which has given useful desalinations is described. (OSW)
W73-11154

TUBE IDENTIFIER,
Oak Ridge National Lab., Tenn.
H. W. Hoffman, and L. G. Alexander.
Available from the National Technical Information Service as ORNL-TM-2713 (rev 1), $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 796, October 1971. 36 p, 2 tab. 14-30-2535 W.O. 7.

Descriptors: *Boiling, *Dropwise condensation, Condensation, Evaporation, *Heat transfer, *Distillation, *Evaporators, *Films, Porous media, *Tubes.
Identifiers: VTC heat transfer surfaces, Evaporator-condenser tubes, Doubly fluted tubes, Corrugated tubes, Porous-surfaced tubes.

This volume provides a physical description of the evaporator-condenser tubes examined at the Oak Ridge National Laboratory under the Office of Saline Water program on Advanced VTE Heat Transfer Surfaces. (OSW)
W73-11155

THE GROWTH RATE OF ICE CRYSTALS: THE PROPERTIES OF CARBON DIOXIDE HYDRATE A REVIEW OF PROPERTIES OF 51 GAS HYDRATES,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.
J. G. Vlahakis, H. S. Chen, M. S. Suwandi, and A. J. Barduhn.
Available from the National Technical Information Service as PB-217 615, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 830, November 1972. 180 p, 48 fig, 44 tab, 187 ref. 14-30-2763.

Descriptors: *Desalination, *Crystallization, *Freezing, Ice, *Hydrate processes, Carbon dioxide.
Identifiers: *Hydrating agents, *Ice crystal growth.

This report consists of four parts. Part 1 gives a brief review of the status of choosing a hydrating agent for use in the hydrate process for desalting. Nine agents are listed and at least four appear to be good possibilities: R-12 (CCl2F2), R-142b (CH3CClF2), R-152a (CH3CHF2), and R-31 (CH2ClF). Of these R-31 looks best. Part 2 covers work on CO2 hydrate for which the basic information are now available to make pilot plant designs and economic analyses. Part 3 is a review of the known properties of 51 gas hydrates including an extensive table of data and 80 references. Part 4 is concerned with ice crystal growth. The linear growth rate in the basal plane of unconfined ice crystals has been maesured in flowing subcooled water and aqueous NaCl solutions. (OSW)
W73-11156

INVESTIGATION OF POLYBENZIMIDAZOLE HOLLOW FIBER REVERSE OSMOSIS DESALINATION MEMBRANES,
Celanese Research Co., Summitt, N.J.
A. A. Boom, H. J. Davis, M. Jaffe, L. A. Lee, and F. S. Model.
Available from the National Technical Information Service as PB-218 055, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 818, August 1972. 55 p, 6 tab, 24 fig, 7 ref. 14-30-2810.

Descriptors: *Reverse osmosis, *Membranes, *Desalination, Permeability, *Fouling, Compaction, *Morphology, Water transport.
Identifiers: Hollow fibers, Polybenzimidazole, Membrane fouling, Membrane compaction, Permeability instrument.

Laboratory evaluations have shown that PBI hollow fiber membranes possess outstanding desalination properties. Water flux as high as 10 gfd and salt rejections as high as 99% have been achieved. Structure-desalination performance correlations were established in morphological examinations employing thermomechanical analysis (TMA), optical microscopy and scanning electron microscopy. Radial void structure, void concentration and shrinkage behavior were found to be related at least in a semiquantitative way to desalination performance based on a Loeb-type membrane structure. Membrane fouling was established as the major cause of the observed decline in flux and rejection, with compaction playing a minor role. Fouling was virtually eliminated by installation of a highly efficient filtration system. Flow testing showed that PBI membranes produce an acidic shift of more than one pH unit in the product water relative to the feed (0.5% NaCl) stream, and to this is ascribed a unique water transport mechanism. The transport of water through PBI and cellulose acetate (CA) films was investigated with the aid of a new permeability instrument to obtain fundamental characterization data on materials possessing good reverse osmosis properties. (OSW)
W73-11157

SPRAY FREEZING, DECANTING, MELTING AND HYDROLYSIS AS RELATED TO SECONDARY REFRIGERANT DESALTING,
Avco Corp., Wilmington, Mass. Avco Space Systems Div.
W. Gibson, G. Grossman, A. Modica, G. Siegelman, and G. Stepakoff.
Available from the National Technical Information Service as PB-218 056, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 816, July 1972. 17 p, 1 fig, 2 tab, 1 ref. 14-30-2770.

Descriptors: *Desalination, *Freezing, *Ice, *Hydrolysis.
Identifiers: Freon 114, *Spray freezer, Indirect melter, Hydrocyclone, Stripping, Decanting.

A secondary refrigerant freezing process is being developed which utilizes a pressurized wash column, indirect melter, and a nonflammable refrigerant. The performance of a spray freezer has been evaluated and it was found that a 50% yield could be achieved over a short fall height yielding crystal sizes in the range of 50-150 m. The crystals are platelets without evidence of dendritic growth. Freon utilization efficiency is close to 100% and production rates based on spray volume attain 600-700 lbs/hr ft3. The slurry has been compacted in a plug and pressure drop measurements have indicated permeabilities between 10-6 and 5 x 10-7 cm2 at pressure drops up to psi/inch. Attendant upon secondary refrigerant freezing in any form is the removal of dispersed refrigerant from the ice-brine slurry which results from incomplete utilization in the freezer. A study of gravity decanting indicated that the characteristic times were too slow for a high rate compact desalting process, thus, the effort was switched to forced decanting as embodied in hydrocyclones. Two types of packing for vacuum strippers were evaluated for their feasibility in terms of cost and physical size. Hydrolysis of refrigerant represents an economic loss to a secondary refrigerant process. A study was conducted to define the magnitude of this problem particularly in terms of the refrigerant of choice F-114. A theoretical model was developed and checked experimentally. Remarkably good agreement was shown and hydrolysis losses were proved to be negligible. The process employs an indirect melting system to prevent contamination of the product water and loss of pump work associated with the pressurized wash column. Theoretical studies of melting phenomena leading to scaling laws were also conducted. (OSW)
W73-11158

RESEARCH ON REVERSE OSMOSIS MEMBRANES FOR PURIFICATION OF WASH WATER AT STERILIZATION TEMPERATURE (165F),
General Electric Co., Lynn. Mass.
J. M. Amore, J. F. Enos, and A. B. LaConti.
Available from the National Technical Information Service as PB-218 162, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 815, December 1972. 57 p, 13 tab, 7 fig. 14-30-2752.

Descriptors: *Reverse osmosis, *Membranes, *Ion transport, Permeability, Separation techniques, Water purification.
Identifiers: *Wash water, Sulfonated polyphenylene oxide, Wash water renovation, Detergent removal (Reverse osmosis), Sterilization (Membranes), Urea removal.

The object of this research was to conduct the necessary modification and development of sulfonated 2, 6-dimethyl polyphenylene oxide (PPO) membrane to obtain optimum reverse osmosis (RO) performance on synthetic and real wash water at sterilization temperatures (greater than or equal to 165 F) and maximum pressure of 800 psi. The goal was to obtain a RO permeate containing less than 10 microorganisms/cc and to achieve a stable flux of 5 gsfd with rejections of NaCl (85.0%), urea (99.3%), lactic acid (99.0%) and detergent or soap (99.9%) with a synthetic wash water feed containing 1500, 1000, 700, and 10,000 ppm, respectively, of the wash water species. Solvent cast sulfonated PPO membranes were

developed with IEC (Ion Exchange Capacity)±1.22 to 2.28. It was demonstrated with real shower water that RO operation with these membranes at 165F yields a permeate free of microorganisms. The low IEC membranes were shown to be extremely stable as evidenced by invariant fluxes and rejections during life tests of up to 3000 hours with 165F wash water containing 10,000 to 20,400 ppm Olive Leaf (soap), Modified Approve (soap/detergent) and dodecylbenzene sulfonate (detergent). During a 3000-hour life test, a 1.36 IEC membrane exhibited a steady state of 3 to 5 gsfd and average rejection of NaCl (97%), urea (45%), lactic acid (99%) and soap (99%). Decreasing the thickness of the 1.3 IEC membranes by approximately an order of magnitude (0.2 to 0.02 mil) increased the initial flux from 1.5 to 18.3 gsfd with essentially no decrease in rejection. RO tests were successfully run at several temperatures (165 to 206 F). pressures (400 to 800 psi), and feed flow rates (0.04 to 2 gal/min) to help define the operating parameters for a practical hardware configuration. (OSW)
W73-11159

ION TRANSPORT THROUGH LAYERED ION EXCHANGE MEMBRANES,
Massachusetts Inst. of Tech., Cambridge, Mass.
A. A. Sonin, and G. Grossman.
Available from the National Technical Information Service as PB-218 236, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 814, July 1972. 48 p, 10 fig, 23 ref. 14-30-2749.

Descriptors: *Desalination, *Ion exchange, *Membranes, *Electrodialysis, *Ion transport.
Identifiers: Anion exchange membranes, Cation exchange membranes, Bipolar membranes, Laminar ion exchange membranes, Current-voltage characteristics.

The steady-state transport characteristics of a family of ion exchange membranes composed of contiguous layers of anion and cation exchange materials are described in terms of a simple physical model. Membranes consisting of up to four layers are considered. Explicit analytic expressions are derived which relate the current-voltage characteristics and transport numbers to the membrane structure and to the concentrations of the bounding solutions. The current-voltage characteristics are shown to be anisotropic with respect to current direction, showing current saturation in one or both directions, depending on membrane structure. The results are compared with available data on bipolar membranes. An analysis is also given for the general performance characteristics, including the effects of concentration polarization in the bounding solutions, of a three-layered membrane consisting of a thick central ion exchange layer sandwiched between two extremely thin ion exchange layers of opposite sign. This combination may serve as a model for the effects of certain types of membrane fouling in practical applications such as electrodialysis. It is shown that even very thin surface layers can reduce the limiting current to a value significantly below the diffusion-controlled one which is expected in the absence of the surface films. (OSW)
W73-11160

INVESTIGATION OF PHASE AND STATE RELATIONS IN COMPLEX LIPID SYSTEMS,
Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
R. C. Bean.
Available from the National Technical Information Service as PB-218 237, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Program Report No 812, November 1971. 60 p, 15 fig, 7 tab. 14-30-2710.

Descriptors: *Membranes, *Desalination, *Ion transport, *Lipids, Permeability, *Reverse osmosis.
Identifiers: *Lipid membranes, Water permeability, Thermal transitions, Amphipathic lipids, Photoelectric reaction, Bilayer lipid membrane, Salt rejection, Lipid-Loaded membranes, Lipid-Skin membranes, Cast lipid membranes.

Permeability was studied with lipids incorporated into membranes or dispersed in a bulk phase. Membrane forms included: the lipid-loaded membrane, in which membranes were prepared by saturating a microporous, polymeric support with lipids and then treating in various ways; the lipid-skin membrane, formed by compressing a thin film of lipid particles onto one face of a microporous support; the cast-lipid membrane, formed by casting a solution containing both lipid and polymer upon a glass surface; and the bilayer lipid membrane (BLM). Results of studies on the lipid-loaded membranes demonstrated that they generally had a low resistance at temperatures below a transition temperature near the melting point of the lipid. At this point, an abrupt 100 to 10,000-fold increase in resistance occurred in all cases, except with primary alkylamines. At temperatures below the liquifying transitions, some membranes had excellent ion selective properties with low resistance (10 to 50 ohm cm2). Various membranes, supported in cellulose ester microporous filters, produced photovoltaic and/or photoconductive responses to ultraviolet illumination. Photopotentials ranging up to 150 mv were obtained. Sensitization to visible lighr could be developed with certain dyes (e.g., methylene blue, rhodamine B). Polyamide membranes case with certain anionic or neutral long alkyl chain lipids incorporated into the casting solutions showed better water permeability and salt rejection than similar membranes prepared without lipids. (OSW)
W73-11161

A STUDY OF VAPOR PHASE POLYMERIZATION AND CROSSLINKING TO PREPARE REVERSE OSMOSIS MEMBRANES,
Research Triangle Inst., Durham, N.C.
H. Yasuda.
Available from the National Technical Information Service as PB-218 238, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 811, June 1972. 104 p, 38 fig, 23 tab, 43 ref. 14-30-2658.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, *Sea water, *Permeability.
Identifiers: *Plasma polymerization, Silent-glow discharge, Composite membranes, Porous substrates, Ultra-thin-films, Organic-nitrogen-compounds, Dry-state-membranes.

Composite membranes are being prepared for use in sea water desalination via reverse osmosis by the vapor phase polymerization and crosslinking of heteroaromatic nitrogen compounds, aromatic amines and other nitrogen containing compounds in a silent glow discharge tube. The plasma formed ultrathin membranes have exhibited salt rejections greater than 99.5 percent at high water flux levels. Membrane performance was found to be stable after 20 days with no visible decline in water flux using 3.5% NaCl at 1500 p.s.i. It is anticipated that the plasma polymerization technique which is under development can be applied to porous substrates in planar, tubular and hollow fiber form. (OSW)
W73-11162

MEMBRANE FOULING IN ELECTRODIALYSIS: A MODEL AND EXPERIMENTS,
Massachusetts Inst. of Tech., Cambridge, Mass.
G. Grossman, and A. A. Sonin.
Available from the National Technical Information Service as PB-218 325, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 813, July 1972. 36 p, 7 fig, 15 ref. 14-30-2749.

Descriptors: *Desalination, *Membranes, *Electrodialysis, *Mathematical models, *Hydrodynamics, Ion exchange, Films.
Identifiers: Limiting current, *Membrane fouling, Colloidal deposits, Ion exchange films, Neutral fouling film, Charged fouling films, Polarization.

Membrane fouling is a common cause for poor performance in electrodialysis systems, usually because it reduces the limiting current. Fouling may be caused by deposits of either neutral matter or colloidal matter with ion exchange properties. In the present paper a model for membrane fouling is developed and expressions are derived for the reduction in limiting current caused by both neutral fouling films and films having ion exchange properties. The effect of fouling is shown to depend not only on the properties of the fouling film, but also on the hydrodynamic conditions in the channels and in the case of ion exchange fouling films on the salt concentration in the dialysate channel. Ion exchange fouling films are shown to be much more effective in reducing the limiting current than neutral films. Some experimental data are presented which confirm the trend of the theory for fouling with ion exchange films. (OSW)
W73-11163

THE ROLE OF DESALTING IN PROVIDING HIGH QUALITY WATER FOR INDUSTRIAL USE,
SCS Engineers, Long Beach, Calif.
C. J. Schmidt, and D. Ross.
Available from the National Technical Information Service as PB-218 465, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 819, December 1972. 146p. 14-30-2776.

Descriptors: *Desalination, *Demineralization, Ion exchange, Membrane processes, Economic feasibility, Costs, *Industrial water.
Identifiers: *Industrial water users, Boiler feed water, Industrial plants, Nuclear plants, Electronics industry, Chemical process industries.

Literature searches, correspondence and field interviews were used to estimate demineralized water requirements of ten major industrial categories. Industrial boiler feed water treatment was the major volume use, followed by power generation, electronics manufacture and chemical process industries. Users of water containing less than 1 ppm TDS included nuclear-fueled power plants, and electronics manufacturers. Desalting equipment is applicable for partial demineralization followed by mixed-bed deionization. Industries requiring water with a quality of 2 to 10 ppm TDS included older fossil-fueled utility power plants, high pressure industrial boilers, chemical process, motor vehicle and aircraft, drug, and photographic supplies. Desalting equipment is applicable for partial demineralization followed by two-bed deionization. Industries requiring water with a quality of 10 to 200 ppm TDS included low pressure industrial boilers, food processors, and producers of primary metals, beverages, paper and bottled water. Partial demineralization by desalting may be the only treatment required. Curves were developed to illustrate cost vs. raw water quality for various product water qualities and treatment systems. Membrane desalting techniques become economically competitive with ion-exchange resins as the dissolved salts in the raw water increase. (OSW)
W73-11164

A NEUTRON SPECTROSCOPIC STUDY OF THE DIFFUSIVE KINETICS AND INTERACTIONS OF WATER IN DENSE LAYER DESALINATION MEMBRANES,
Union Carbide Corp., Tuxedo, N.Y.

G. J. Safford, and P. S. Leung.
Available from the National Technical Information Service as PB-218 547, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 834, July 1972. 53 p, 14 fig, 1 tab. 14-30-2891.

Descriptors: *Desalination, Physicochemical properties, *Reverse osmosis, *Membrane processes, Membranes, *Diffusion, *Kinetics.
Identifiers: *Neutron spectroscopy, Differential scanning calorimeter.

Neutron spectroscopic investigations were carried out to systematically study and determine, at a molecular level, the factors and properties that control the diffusion and bonding of water in 'dense skin' cellulose-acetate desalination membranes. Data were taken both to determine the functional form of the diffusive kinetics that characterizes the transport of H2O molecules in membranes and then study the influence on the bonding and kinetics of the individual water of: (a) extent of membrane hydration, (b) number of hydrophilic groups, (c) variations in molecular weight, (d) temperature, (e) the presence of all included salt (NaCl), and (f) heat treatment and compaction and their relationship to the casting process. To complement the neutron scattering results, differential scanning calorimetric measurements were made to determine the transitions characteristic of the 'dense layer' materials. The relationship between these transitions and the membrane morphology as well as variations that result from different casting techniques and heat treatment are discussed. (OSW)
W73-11165

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa.
For primary bibliographic entry see Field 01B.
W73-11166

DISPERSION AND MISCIBLE DISPLACEMENT,
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.
W. N. Gill, T. S. Lin, R. J. Nunge, M. Posner, and R. Sankarasubramanian.
Available from the National Technical Information Service as PB-218 549, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 822, December 1972. 132 p, 49 fig, 4 tab, 58 ref. 14-01-0001-1792.

Descriptors: *Dispersion, Convection, *Mixing, Mass transfer, *Desalination, Reviews.
Identifiers: *Miscible displacement.

The state of the literature when this work was begun can be summarized as follows: Dispersion models were assumed to apply to initial value problems like dispersion of a slug stimulus and transient boundary value problems like a uniform step change at the inlet to a tube, subject to the condition that they are valid only after a certain amount of time has elapsed since the start of the process. In such cases the dispersion coefficient was a constant depending upon flow geometry and conditions of flow if the flow was steady, and time dependent if the flow was time dependent. These models were, and still are, used to describe transport processes in a variety of situations such as chemical reactors, packed bed adsorption columns, double-pipe heat exchangers, etc. Using the series solution developed by Gill, the dispersion model can be derived from first principles, without making any arbitary assumptions, in a more general form which describes unsteady convective diffusion phenomena right from time zero in initial value problems. Furthermore the method of analysis developed here takes into account nonuniformities in the initial distribution which occur in practical cases. The technique will be extended to handle continuous source problems, such as material pollution into fluid streams, by using a superposition intergral. Unsteady convective diffusion due to a step change at the inlet is a special case of the continuous sorce problem. Results were developed which show the approach with increasing time, of this solution to the Taylor-Aris description of the problem. Then, an approximate solution for dispersion in vertical flows with significant buoyancy forces is developed. (OSW)
W73-11167

CENTRIFUGAL DISTILLATION SYSTEM,
F. Rosa.
U. S. Patent No. 3,725,209, 10 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 301, April 3, 1973.

Descriptors: *Patents, *Distillation, Sea water, *Evaporation, *Centrifugation, *Heat exchange, Potable water, Water treatment, *Water purification.
Identifiers: Compression.

An improved apparatus and process is described for producing purified water more economically by low temperature, low pressure distillation using a combination of flash evaporation and vapor compression and condensation, and using centrifugal force to reduce the driving potential required to vaporize water from seawater and then to condense the vapor for withdrawal and use. The invention provides a void or vapor space within a rotating enclosure, introduces the distilland into an evaporating zone in the central portion of the enclosure to cause part of the distilland to flash into vapor, and condenses the vapor in a condensing zone around the evaporating zone by a combination of centrifugal compression developed by the rotating enclosure and circulating of distilland through the condensing zone in heat-exchanging relation with the vapor and condensed distillate therein. (Sinha-OEIS)
W73-11223

APPARATUS FOR USE IN AN IMPROVED ELECTRO-DIALYSIS PROCESS,
Consiglio Nazionale delle Ricerche, Rome (Italy).
R. Passino, and G. Boari.
U. S. Patent No. 3,728,248, 2 p, 6 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 1052, April 17, 1973.

Descriptors: *Patents, Cation exchange, *Membranes, Resins, Salt water, *Electrodialysis, *Desalination, Sea water, *Demineralization.
Identifiers: *Ion-selective membranes.

The apparatus for demineralizing salt water consists of a hydrogen form cation exchanger and a sodium form cation exchanger. Salt water moves through the exchangers in parallel flow in a special proportion and the combined stream then passes through salt diluting chambers of an electrodialysis cell having ion-selective membranes. A decomposition voltage is passed across the electrodes. The concentrated salt stream is withdrawn and used to regenerate the sodium exchange resin. (Sinha-OEIS)
W73-11230

SOFTENING OF SEA WATER BY ADDITION OF BARIUM CARBONATE AND CO2,
Department of the Interior, Washington, D.C. (Assignee).
For primary bibliographic entry see Field 05F.
W73-11236

SOFTENING OF SEA WATER BY ADDITION OF BARIUM CARBONATE AND MINERAL ACID,
Department of the Interior, Washington, D.C. (Assignee).
For primary bibliographic entry see Field 05F.
W73-11237

REVERSE OSMOSIS WATER PURIFYING SYSTEM WITH GRADIENT BARRIER WATER STORAGE CONTAINER,
Desalination Systems, Inc., Escondido, Calif. (assignee)
D. T. Bray.
U.S. Patent No. 3,726,793, 2 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 2, p 683, April 10, 1973.

Descriptors: *Patents, *Reverse osmosis, Separation techniques, *Desalination, *Water treatment, *Water purification, Water quality.
Identifiers: *Temperature gradient, Density gradient, Water storage container.

A reverse osmosis water purification system is provided with an easily cleaned storage container werein a temperature gradient barrier is created at the interface between the purified product water and feed water to minimize intermingling of these waters. A product water storage container for the reverse osmosis water purification system supplies warmer product water to the upper end of the container and connects the lower end of the container to a line containing pressurized feed water. A pump produces pressure for the reverse osmosis process. The storage container is insulated to maintain the relative temperature of the two waters and to reduce the creation of convection currents. (Sinha-OEIS)
W73-11356

FLASH EVAPORATOR STRUCTURE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
R. W. Goeldner.
U.S. Patent No 3,729,383, 4 p, 19 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1348, April 24, 1973.

Descriptors: *Patents, *Flash distillation, *Evaporators, *Desalination, Equipment, Salt water, Water treatment, Water quality.

A horizontally arranged multistage flash evaporator is described. A tubular vessel is divided into many flash chambers by transverse partitions. At their lower end the partitions provide a passage for feedwater from chamber to chamber. The flow of feedwater is regulated to effect a water seal between chambers. (Sinha-OEIS)
W73-11358

A LITERATURE SURVEY--PERFORMANCE OF EXCEPTIONAL METALS IN CORROSIVE ENVIRONMENTS,
National Association of Corrosion Engineers, Houston, Tex.
For primary bibliographic entry see Field 08G.
W73-11479

NUCLEAR DUAL PURPOSE PLANTS IN REGIONAL DEVELOPMENT,
Atomic Energy Commission, Oak Ridge, Tenn.
D. F. Cope, J. C. Jorgenson, and M. Lopez.
Paper, Int Symp Plann Water Resour, Mexico City, Mexico, Dec 1972. 38 p, 2 fig, 28 ref.

Descriptors: *Distillation, *Water costs, Desalination, Nuclear powerplants, *Desalination plants, *Mexico, *Southwest US, Electric power production, Environmental effects, California, Water resources, Fresh water, Nuclear energy, Technology, Municipal water, Industrial water, Irrigation water, Ecology, Bibliographies.
Identifiers: Nuclear power, Dual purpose nuclear plants, Electric power production.

Advantages of coupling water distillation and electricity generating plants into dual purpose facilities for simultaneous production of fresh water and electricity has been recognized for some time.

Nuclear energy is well suited as an energy source for these large dual purpose facilities, and water distillation plants are adaptable for coupling to nuclear reactors. Cost of produced water is generally higher than the price of natural water. However, this cost will decrease as experience is gained from building and operating more and larger dual purpose plants. New incremental supplies of natural water are insufficient to meet projected needs of many regions of the world. Desalting sea water using nuclear dual purpose plants seems to be the least expensive alternative for meeting future requirements. One region particularly suited for application of large nuclear powered dual purpose plants is Southwest US/Northwest Mexico. This region has rich productive land, but suffers from a shortage of fresh water, though the Pacific Ocean provides unlimited supplies of sea water for desalting. The role of dual purpose plants for this region and as related to other regions is discussed. (USBR)
W73-11496

3B. Water Yield Improvement

EMERGING WATER SUPPLY TECHNOLOGY.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 03D.
W73-11246

OPTIMUM HOLE DIAMETER FOR WATER WELLS,
For primary bibliographic entry see Field 08A.
W73-11468

THE IMPACT OF WEATHER MODIFICATION ON U.S. PLANNING FOR THE RIO COLORADO AND RIO GRANDE,
Bureau of Reclamation, Denver, Colo.
W. E. Howell.
Paper, Int Symp Plann Water Resour, Mexico City, Mexico, Dec 1972. 11 p.

Descriptors: *Weather modification, *Meteorology, *Cloud seeding, Snowpacks, Planning, Clouds, Rainfall, Constraints, Costs, Snowfall, Precipitation (Atmospheric), Water management (Applied), Streamflow, Desalination, Flow augmentation, Water reuse, Rio Grande River, Colorado River Basin.
Identifiers: Western U.S. Water Plan, Skywater Project, Water resources management, Cloud modification, Induced precipitation.

Under Project Skywater, the Bureau of Reclamation is conducting research and experimentation to develop weather modification technology for application to water resources management problems. These activities include an experimental program of cloud seeding for increasing winter snowpack in the Jemez Mountains of New Mexico, which drains into the Rio Grande, and a pilot project for snowpack in the San Juan Mountains of Colorado, from which meltwater reaches both the Rio Grande and the Colorado Rivers. Results indicate that under certain meteorological conditions associated with temperature distribution within the cloud systems, cloud seeding increases precipitation by 100% or more. Potential streamflow increases depend upon the frequency of occurrence of favorable conditions in given geographic and climatic settings. Estimates of water augmentation by snowfall stimulation in the Colorado and Rio Grande Basins are being incorporated into the Western US Water Plan. Estimated snowfall stimulation will contribute approximately 2 million acre-ft annually, or about a 14% increase, to the flow of the Colorado River at Lee's Ferry, Arizona, and about 100,000 acre-ft annually to the flow of the Rio Grande River at Bernalillo, New Mexico. (USBR)
W73-11505

WATERSHED RESEARCH,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 02A.
W73-11534

WATER RESOURCES INVENTORY OF CONNECTICUT: PART 6. UPPER HOUSATONIC RIVER BASIN,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 02A.
W73-11555

HIGH-TEMPERATURE CONTACT NUCLEATION OF SUPERCOOLED WATER BY ORGANIC CHEMICALS AND APPENDIX OF COMPOUNDS TESTED,
Naval Weapons Center, China Lake, Calif. Michelson Labs.
A. N. Fletcher.
Available from NTIS, Springfield, Va 22151 as AD-753 465. Price $3.00 printed copy; $0.95 microfiche. Technical Publication 5439, November 1972. 16 p, 1 fig, 2 tab, 15 ref, append. (Reprinted from Journal of Applied Meteorology, Vol 11, No 6, p 988-993, September 1972.)

Descriptors: *Nucleation, *Freezing, *Organic compounds, Cloud seeding, Research and development, Testing procedures, Atmosphere, Temperature, Heat transfer, Supercooling, Weather modification, Artificial precipitation, Clouds, Evaluation.

In order to make an effective study and use of ice-nucleating agents for cloud seeding, it is essential that their characteristics be known under a range of conditions. A simple, rapid test is described that measures contact nucleation of supercooled water. Application of this contact-nucleation test at -3C to over 1,000 organic compounds resulted in only 47 that could be considered as 'active.' Materials such as metaldehyde, fluorenone, phenazine and phloroglucinol dihydrate were not found to be sufficiently 'active' to pass the contact-nucleation test in an unground state. It is proposed that the initial water-air interface may pass through a configuration that promotes the growth of ice embryos even though the final compound-water interface has a low 'activity,' i.e., a low prewet-nucleation temperature. Conversely, some compounds such as phloroglucinol dihydrate show little 'activity' for contact nucleation yet have a high prewet-nucleation temperature. A table of compounds passing contact-nucleation test at -3.0C includes their sources; average time to initiate freezing; percent of drops frozen unground and ground; and previously reported results. An appendix includes all organic compounds tested at -3C for contact nucleation of supercooled water. (Woodard-USGS)
W73-11699

3C. Use of Water of Impaired Quality

SHORT-TERM EFFECTS OF IRRIGATION WITH HIGH SODIUM WATERS,
New Mexico State Univ., University Park. Dept. of Agronomy.
J. U. Anderson, O. F. Bailey, and H. E. Dregne.
Soil Sci. Vol 113, No 5, p 358-362. 1972.
Identifiers: *Cotton-D, Irrigation, *Sodium waters.

The effects of 17 yr irrigations were studied to observe changes, to account for the initial success, and to relate changes in exchangeable sodium percentage (ESP) to predictive indices. Marked increases in ESP occurred in each of the 2 soil profiles in both surface and subsurface horizons. These increases were much greater in the soil which received an estimated 107 cm of irrigation annually than in the one which received an estimated 76 cm. Carbonate precipitation is believed to be occurring in the latter, and measured ESP is greater than the sodium absorption ratio (SAR). ESP is lower than SAR in the soil receiving the larger amount of irrigation water, indicting that equilibrium has not yet been achieved. The correlation coefficient (R) for ESP vs. estimated ESP was 0.91. The critical level of ESP for cotton growth appears to be about 25 in this situation.--Copyright 1972, Biological Abstracts, Inc.
W73-11111

COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-11264

3D. Conservation in Domestic and Municipal Use

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY : APPENDIX H, MINERALS.
Bureau of Mines, Washington, D.C.

North Atlantic Regional Water Resources Study Coordinating Committee Report, May 1972. 98 p, 14 fig, 4 tab.

Descriptors: *Water quality, *Mineralogy, *Mineral industry, *New England, *Water pollution sources, Water pollution control, Pollution abatement, Metals, Mining, Industrial production, Reviews, Projections, River basins.
Identifiers: *Mineral resources, North Atlantic Region, Middle Atlantic areas, Non-metals.

This report was compiled at the request of the Army Corps of Engineers and is a general appraisal of the mineral resources of the North Atlantic Region (NAR). Data were compiled on the water-related mineral commodities and their resources. Emphasis was placed on those minerals whose production or processing involves the use of significant quantities of water, or may cause water pollution, or may result in solid waste disposal problems. The study covers the mineral industry in all New England States, New Jersey, Delaware, and those portions of New York, Pennsylvania, Maryland, Virginia, and West Virginia that are in the New England and Middle Atlantic areas established by the Water Resources Council and designated as the North Atlantic Region. The analysis of data on water use by the mining industry and its waste water disposal problem is included. Data were compiled on the quantity and value of minerals produced in the Region in 1964. A table shows values of mineral production for all counties in NAR in 1969 and 1970. Water use data for 1962, obtained by canvassing mineral producers, were used to estimate future water requirements based on projections of mineral production. (Woodard-USGS)
W73-11107

ENVIRONMENTAL HEALTH PLANNING.
Bureau of Community Environmental Management, Rockville, Md.
For primary bibliographic entry see Field 05G.
W73-11244

SCOPE OF PUBLIC WATER SUPPLY NEEDS.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 06D.
W73-11245

EMERGING WATER SUPPLY TECHNOLOGY.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York,

Albany.

March 1, 1973. 106 p, 11 fig, 9 tab, 24 ref, 2 append.

Descriptors: *Water supply, *Desalination, *Weather modification, *Water reuse, *Groundwater recharge, Water demand, Environmental effects, *New York.
Identifiers: Southeastern New York, *New York City.

Three technological means for increasing the water supply in southeastern New York, including New York City, are evaluated by a state commission appointed by Governor Rockefeller. The commission was to determine longrange water supply needs, evaluate alternatives to meet the needs, and make recommendations based on costs, administration feasibility, and environmental impacts. The emphasis of this report is on the technological alternatives of desalinization, weather modification, and waste water reuse. Desalinization was not recommended for southeastern New York because of excessive costs and problems of plant location and brine disposal. Weather modification was not recommended because of the uncertainty involved, the likelihood of only small increases in water supply, and the need to construct more reservoirs to hold water. Direct reuse and recycling of waste water was not recommended because of dangers to public health, however, indirect reuse was recommended, particularly groundwater recharge. For example, there is great potential for deep well recharge on Long Island. (Elfers - North Carolina)
W73-11246

WATER SUPPLY PLAN FOR THE SOUTHEASTERN CONNECTICUT REGION, VOLUME II, RECOMMENDED PLAN.
Southeastern Connecticut Water Authority, Norwich; and the Southeastern Connecticut Regional Planning Agency, Norwich.
For primary bibliographic entry see Field 06B.
W73-11249

BROWN COUNTY SEWAGE AND SOLID WASTE STUDY - 1972.
Brown County Regional Planning Commission, Green Bay, Wis.
For primary bibliographic entry see Field 05E.
W73-11250

HOUSING AND PLANNING REFERENCES.
Department of Housing and Urban Development, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.75. New Series No 46. January-February, 1973. 96 p.

Descriptors: *Bibliographies, *Publications, *City planning, Water supply, Sewerage, Recreation, Pollution abatement, Natural resources, Environment effects, Ecology.

This selective bibliography contains 1470 references to publications and articles received by the Library of the Department of Housing and Urban Development. Subject entries in the main text (808 ref.) are primarily oriented toward housing, urban design and land use planning. However, several categories relate to urban water resources including ecology and environment, natural resources, pollution control, recreation, sewage disposal and storm sewers, and water supply. Comprehensive Planning (701) reports (662 ref.) are listed geographically by states and give HUD Library accession numbers. A list of 14 new periodicals and a selection of books are included. (Hufschmidt-North Carolina)
W73-11251

REGIONAL WASTE WATER, SOLID WASTE DISPOSAL, WATER SUPPLY, AND STORM DRAINAGE SYSTEMS APPRAISAL.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-11252

URBANIZATION'S DRAINAGE CONSEQUENCE,
Nolte (George S.) and Associates, San Jose, Calif.; and San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 04C.
W73-11254

COMMUNITY IMPROVEMENTS AND SERVICE COSTS,
South Dakota State Univ., Brookings.
M. L. Anderson.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 99, No UP1, p 77-92, March, 1973. 15 fig, 2 tab, 4 ref.

Descriptors: *Public utilities, *Cost analysis, Sewerage, Water supply, Construction costs, Design criteria, Planning, *Wisconsin.
Identifiers: *Milwaukee Metropolitan Region.

The relationships between urban population density and costs of public utilities, i.e. sanitary sewer and water mains, are explored in this study. Data are taken from four suburbs around Milwaukee and synthesized to produce various cost curves. There is a need for cost data on public utility extensions and maintenance in order to develop planning and design standards. It was expected that an optimal population density for minimizing costs would be found, but such a level is not clear from the analysis. Some of the conclusions are that (1) the cost of construction of sanitary sewer mains increases at a decreasing rate up to about 12 persons per acre and decreases from 12 to 16 persons per acre; (2) the cost of sanitary sewer maintenance increases at a decreasing rate; and (3) the construction cost of water distribution systems increases up to 12 persons per acre and then decreases from 12 to 16 persons per acre. The article includes 15 graphs representing these data. (Elfers-North Carolina)
W73-11255

PUBLIC PARTICIPATION IN URBAN WATER PLANNING,
Fort Lewis Coll., Durango, Colo.
For primary bibliographic entry see Field 06B.
W73-11257

MOBILE AREA WATER TRANSPORTATION STUDY OF MOBILE, BALDWIN AND ESCAMBIA COUNTIES, ALABAMA.
Tippetts Abbett McCarthy Stratton, New York.
For primary bibliographic entry see Field 08A.
W73-11260

COMPREHENSIVE WATER SEWER PLAN FOR BALDWIN COUNTY, ALABAMA.
Polyengineering, Mobile, Ala.
For primary bibliographic entry see Field 05D.
W73-11261

COMPREHENSIVE WATER AND SEWER PLAN FOR ESCAMBIA COUNTY, ALABAMA.
Polyengineering, Mobile, Ala.
For primary bibliographic entry see Field 05D.
W73-11262

PUBLIC UTILITIES IN WINNEBAGO COUNTY.
City-County Planning Commission, Rockford, Ill.

Series No RWCCPC-70-3, August 1970. 141 p, 14 fig, map, 24 ref, 2 append. Ill. P-217.

Descriptors: *Planning, *Water distribution, *Sewerage, Project planning, Utilities, Financing, Water management, Water demand, *Illinois.
Identifiers: *Utility extension planning, Rockford (Ill), Winnebago County (Ill).

The inventory and analysis of existing water supply and sanitary sewer systems plus recommendations for future expansion are presented. The analysis consists of some basic discussions of water supply systems, water demands, sanitary sewer and treatment systems, and septic tank problems. The extension plans are presented in detail via maps and project listings and are based on metropolitan goals and policies and related to land use planning. The study is particularly concerned with the implementation of the proposed extensions and recommends careful financial planning including the use of service charges, the creation of a water supply authority well in advance of the future need to develop surface water supplies, and the extension of the present sanitary district to cover most of the county. Storm water drainage is recommended to be studied in a separate report. (Elfers-North Carolina)
W73-11263

3E. Conservation in Industry

THE ROLE OF DESALTING IN PROVIDING HIGH QUALITY WATER FOR INDUSTRIAL USE,
SCS Engineers, Long Beach, Calif.
For primary bibliographic entry see Field 03A.
W73-11164

MINERAL INDUSTRY VS. ECOLOGY.
For primary bibliographic entry see Field 05G.
W73-11185

ENERGY VS. ENVIRONMENT,
For primary bibliographic entry see Field 06G.
W73-11500

3F. Conservation in Agriculture

RESPONSE OF RELATIVE WATER CONTENT IN ZEA MAYS L. TO CHANGES OF POTENTIAL IN THE RHIZOSPHERE AND ATMOSPHERE,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
L. A. Downey.
Agric Meteorol. Vol 10, No 1/2, p 137-140, 1972. Illus.
Identifiers: *Atmosphere, Floods, Irrigation, *Soil matric potential, Relative water content, *Rhizosphere, Soils, Vapor pressure deficit, *Zea-Mays-M.

Relative water content (RWC) of Z. mays was depressed by both an increase in vapor pressure deficit (VPD) or by a decrease in soil matric potential. When the soil matric potential ± -1.5 bar an increase of 80 mbar in VPD depressed the RWC by 30%: indicating that, with flood irrigation, it may be difficult to completely eliminate water stress in crops grown in semi-arid regions.–Copyright 1972, Biological Abstracts, Inc.
W73-11145

PROGRAMING MODEL FOR EVALUATING ECONOMIC AND FINANCIAL FEASIBILITY OF IRRIGATION PROJECTS WITH EXTENDED DEVELOPMENT PERIODS,
California Univ., Davis. Dept. of Agricultural Economics.
G. W.Dean, H. O. Carter, Y. Isyar, and C. V. Moore.
Water Resources Research, Vol 9, No 3, p 546-555, June 1973. 4 fig, 1 tab, 6 equ, 14 ref.

Descriptors: *Linear programming, *Irrigation, Projects, *Economic efficiency, *Financial feasibility, *California, Water resources, *Planning, Agriculture, Crops, Costs, Equations, Mathematical models, Systems analysis, Cost-benefit analysis.
Identifiers: *San Joaquin Valley (Cal.), Repayment analysis.

A multiperiod linear programming model of regional irrigation development is formulated to provide an operational approach to improved evaluation of economic efficiency (benefit-cost analysis) and financial feasibility (repayment analysis) of irrigation projects. The model is particularly useful where the time path of development is critical, for example, in large projects where market restrictions for the products produced may permit only a gradual approach to full development over a long period of time; the MPLP model incorporates sufficient flexibility to handle a wide range of differing empirical situations. The relationship of the model to economic theory and current agency practice is briefly outlined. An empirical application of the model to a large-scale component of the California water plan is reported; results show some deficiencies in previous planning procedures that may lead to difficulties in project repayment and create unforeseen negative welfare effects on nonproject producers. (Bell-Cornell)
W73-11149

STOCHASTIC RESERVOIR MANAGEMENT AND SYSTEM DESIGN FOR IRRIGATION,
New South Wales Univ., Kensington (Australia). School of Economics.
N. J. Dudley, and O. R. Burt.
Water Resources Research, Vol 9, No 3, p 507-522, June, 1973. 3 fig, 22 ref.

Descriptors: *Stochastic processes, *Reservoirs, *Management, *Design, *Irrigation, *Dynamic programming, Crops, Optimization, Simulation analysis, Irrigation efficiency, Estimating, Water resources development, Acreage, Value, Benefits, Decision making, Systems analysis, Mathematical models, Variability.
Identifiers: Design variables, Interseasonal, Intraseasonal, Intertemporal, Water application rates, Reservoir capacity, Distribution systems.

An integrated intraseasonal and interseasonal stochastic dynamic programming model is developed to determine an optimal decision rule with respect to the following classes of crop irrigation decisions: (1) intertemporal water application rates; (2) whether or not some acreage should be relinquished from further irrigations for the remainder of the season; and (3) the optimal acreage to plant for potential irrigation at the beginning of the season. Solutions of the problem are shown to be a basis for optimizing the levels of three design variables: Developed irrigation acreage, reservoir capacity, and distribution system capacity. A method is presented for incorporating variance, as well as expected value, of the net benefits into the decision criterion for optimal developed acreage. An application is made to a simplified real situation in which optimal acreage to develop is the only design variable. State variable transition probabilities are calculated by a simulation model. A significant trade-off is found between expected net benefits and their variability in determination of the optimal developed acreage for irrigation. (Bell-Cornell)
W73-11152

RADIAL PROPAGATION OF WATER POTENTIAL IN STEMS,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz, and B. Klepper.
Agron J. Vol 64, No 4, p 469-473, 1972. Illus.
Identifiers: Bark, *Cotton-D, Diffusion, Equations, Gossypium-Hirsutum-D, Mathematical studies, Phloem, *Radial propagation (Plants), Stems, Xylem.

Contraction and expansion of a cotton (Gossypium hirsutum L.) stem in response to a diurnal cycle of leaf water potential is described mathematically using a passive diffusion analysis. The domain of the problem is the stem phloem and associated tissues that are bounded on the outside by impervious bark and on the inside by the xylem that is assigned measured values of leaf water potential. Semiquantitative predictions are derived from numerical solutions of the linear radial diffusion equation, which yield phloem water potential as a function of space and time. Computations relating stem diameter, leaf water potential, and water flow between xylem and phloem fit experimental data. An apparent hysteresis in the stem diameter-leaf water potential relationship is partly explained in terms of the physics of the diffusion process in the stem. This study offers possibilities for relating internal plant water status to measurable external quantities such as stem diameter and for developing a nondestructive technique for the determination of plant xylem water potential.--Copyright 1972, Biological Abstracts, Inc.
W73-11181

COMPARISON OF SIMULATED AND ACTUAL EVAPORATION FROM MAIZE AND SOIL IN A LYSIMETER,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 02D.
W73-11201

FREEZE-FREE (32 F) SEASONS OF THE MAJOR BASINS AND PLATEAUS OF NEVADA,
National Weather Service, Reno, Nev. Weather Service Office.
For primary bibliographic entry see Field 07C.
W73-11218

INFLUENCE OF SOIL TEMPERATURE AND MOISTURE ON SURVIVAL AND GROWTH OF STRANDS OF PHYMATOTRICHUM OMNIVORUM,
Ruhr-Universitaet Bochum (West Germany). Lehrstuhl fuer Pflanzenphysiologie.
J. E. Wheeler, and R. B. Hine.
Phytopathology. Vol 62, No 8, p 828-832, 1972. Illus.
Identifiers: *Cotton, Fungus, Germination, Growth, *Phymatotrichum-omnivorum, Soils, Survival, Soil temperature, Soil moisture.

Strands of P. omnivorum on roots of cotton plants killed by the fungus during the summers of 1968 and 1969 were not viable after midsummer of 1969 and 1970, respectively. Strands buried 25 cm deep in the rhizosphere of cotton plants growing in the field did not survive longer than 3 mo. Strands introduced into nonsterile Gila silt loam (GSL) at 10 deg C at initial moisture levels of 12, 22 and 30% (equivalent to 15, 1/3 and 1/10 atmospheres tension, respectively) were viable after 9 mo. when moisture levels had decreased to as low as 8% (oven-dry basis). No strands survived 6 mo. at 27 and 32 deg C at the 3 moisture levels. Optimum strand formation occurred at 27 and 32 deg C in nonsterile GSL at 22 and 30% moisutre levels. Strand formation was sparse at 16 and 35 deg C. No structures occurred at 10 or 40 deg C. Strands placed in nonsterile GSL at 22% moisture, germinated at 10 deg -32 deg C, but not at 35 deg C.--Copyright 1973, Biological Abstracts, Inc.
W73-11248

FERTILIZER RESPONSE TO THE PHYSICAL EFFECTS OF SOIL COMPACTION,
Uttar Pradesh Inst. of Agricultural Sciences, Kanpur (India).
Y. P. Singh, and R. N. Gupta.
J Indian Soc Soil Sci. Vol 19, No 4, p 345-352. 1972. Illus.
Identifiers: *Fertilizers, Growth, Nutrients, *Soil compaction, *Wheat-M, Yield, Soil physical properties.

The effect of fertilizer response to various levels of soil compaction on the growth, nutrient uptake and yield of wheat in an artificially compacted fine sandy loam soil was studied. Eight levels of compaction (1.11, 1.18, 1.26, 1.35, 1.44, 1.53, 1.61 and 1.70 gm/cc) and 2 levels of fertility (control and 150 ppm N + 75 ppm P2O5 + 75 ppm K2O) were tried in 3 replications. Compacting the soil from 1.11-1.70 gm/cc resulted in large decrease in its total and aeration porosity and hydraulic conductivity. The relationship between bulk density of soil and crop growth or nutrient uptake was parabolic in nature. An optimum compaction of 1.35 gm/cc was most favorable for crop growth. Fertilization failed to alleviate the adverse effect of soil compaction. Fertilizer response was maximum at the optimum bulk density of 1.35 gm/cc and was considerably reduced at higher and lower compaction levels. Interaction between compaction and fertility was significant for number of ear bearing tillers, uptake of N and P.--Copyright 1972, Biological Abstracts, Inc.
W73-11280

THE EFFECTS OF WATER STRESS ON NITROGEN-FIXING ROOT NODULES: II. EFFECTS OF THE FINE STRUCTURE OF DETACHED SOYBEAN NODULES,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
J. I. Sprent.
New Phytol. Vol 71, No 3, p 443-450, 1972. Illus.
Identifiers: Air, Cells, Cortex, Cytoplasm, Infected, Mitochondria, *Nitrogen-fixing nodules, Nodules, Pericycle, Plasmodesmata, Ribosomes, *Root nodules, *Soybean-D nodules, Tissue, Vacuole, Vascular traces.

The fine structure of the noninfected (outer) region of a soybean root nodule is described. Apart from vascular traces, the cells are mainly vacuolate, with active cytoplasm. They are connected with each other and to cells of the infected region by numerous plasmodesmata. A network of air spaces runs throughout the nodule. Atmospherically applied water stress affects the outer cells of the nodule more quickly and more severely than the inner cells. In any region, vacuolate cells are more susceptible to stress than nonvacuolate cells. Loss of about 30% of their fresh weight results in breakdown of the cytoplasm into approximately spherical subunits, some of which are coated with ribosomes. Organelles such as nuclei and mitochondria retain their structure longer than the rest of the cytoplasm. More severe stress is needed to affect infected and pericycle cells, which are nonvacuolate. It is concluded from the fine structure of stressed and unstressed nodules that the vacuolate cells of the cortex play an integral part in the N-fixing activities of the whole nodule. (See also W72-02633 and W73-11416)--Copyright 1972, Biological Abstracts, Inc.
W73-11415

THE EFFECTS OF WATER STRESS ON NITROGEN-FIXING ROOT NODULES: III. EFFECTS OF OSMOTICALLY APPLIED STRESS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
J. I. Sprent.
New Phytol, Vol 71, No 3, p 451-460, 1972. Illus.
Identifiers: Acetylene, Applied, Cells, Cortical, Mannitol, *Nitrogen-fixing nodules, *Osmotic stress (Plants), Respiration, Root nodules, Roots, Salt, Solutions, *Soybean-D roots.

The effects of osmotic stress on N fixation and respiration of soybean root nodules were investigated. Nonelectrolytes, such as mannitol, depressed acetylene reduction when given to detached nodules in sufficient concentration to withdraw water from them. When given to the root systems of whole plants, hypotonic concentrations of mannitol had a depressing effect after 1-2 hr, the exact time depending on the size of the nodules. Equivalent concentrations of salts had a

much more rapid effect on whole root systems and on detached nodules (less than 5 min); 100 meq/l almost stopped acetylene reduction by small nodules. These effects could not be transmitted via the roots and needed contact between salt solution and nodules. They were accompanied by a decrease in respiratory activity and were fully reversible if the root systems were flushed with water within a few hours of treatment. High salt concentrations, as in sea water, had a rapid (1--2 min) effect, which after 20 min became irreversible. The effects of salt stress are interpreted as resulting from alterations in the metabolism of the cortical cells of the nodules. (See also W73-11415)--Copyright 1972, Biological Abstracts, Inc.
W73-11416

HYDROLOGY OF TRUCKEE MEADOWS, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 04B.
W73-11430

PREDICTION MODELING FOR SALINITY CONTROL IN IRRIGATION RETURN FLOWS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 05G.
W73-11441

WATER REQUIREMENTS FOR OPTIMUM CROP YIELD,
Corps of Engineers, West Palm Beach, Fla.
S. F. Shih, R. E. Sneed, and R. S. Sowell.
Paper 72-773, 1972 Annual Meeting American Society of Agricultural Engineers, Chicago, Ill, Dec 1972. 16 p, 6 tab, 5 ref.

Descriptors: *Agronomy, *Water requirements, *Crops, Mathematical models, Water utilization, Root systems, Time, Irrigation efficiency, Computer programs, Consumptive use, Crop response, Soil-water-plant relationships, Fourier analysis, Growth stages, Growth rates, Root development, Soils, Plant growth, Crop production.
Identifiers: Coefficients.

Two mathematical models developed to provide input for determining agricultural water requirements are presented. One determines the water requirement of a plant as a function of time after planting; the other determines the rooting depth as a function of time from date of planting and soil type. Both models are formulated to make daily calculations from planting date through maturity. Computer programs were developed to determine coefficients of the equations presented. With these coefficients, the model was then used to predict water use and rooting depth of plants as a function of time during the growing season. Predicted water use agreed closely with observed data for selected crops grown in North Carolina. Applications of the water use model and the root depth model are tabulated. With the tabulated data and rainfall data, the water-holding capacity of the soil will be used to determine irrigation water requirements for each soil/crop combination in any of the 60 time intervals during the year. (USBR)
W73-11507

REHABILITATION OF IRRIGATION SYSTEMS FOR SALINITY CONTROL,
Colorado State Univ., Fort Collins.
G. V. Skogerboe, and W. R. Walker.
Paper 72-761, 1972 Annual Meeting American Society of Agricultural Engineers, Chicago, Ill, Dec 1972. 13 p, 11 ref, append.

Descriptors: *Return flow, *Salinity, *Water quality control, *Hydraulic structures, Irrigation water, Rates of application, Canal seepage, Water quality, Subsurface drainage, Water management (Applied), Irrigation operation and maintenance, Irrigation practices, Consumptive use, Irrigation design, Agricultural engineering, Automatic control.

Prevention or control of salinity added to water resources from irrigation return flow is both difficult and expensive. Potential solutions and control measures involve rehabilitation of the irrigation system by structural improvements and improving water distribution to better control cropland applications. Purposes and design criteria for some fundamental hydraulic structures discussed are: canal turnouts, control structures, flow measuring structures, canal linings, and farm structures. Automation and prefabrication are seen as time, labor, and money-saving aspects of successful system rehabilitation. Distribution system management methods must be revised so that only the required water is delivered to individual turnouts. Mandatory use of call periods will aid on farm irrigation efficiencies by encouraging farmers to plan their irrigation. Irrigation scheduling services combining meteorological data and soil moisture levels to forecast future irrigations in applied depths as well as timing are described. The importance of canal maintenance, managing system storage reservoirs, and managing waste water are discussed. Increasing water-use efficiency is not only a requirement for greater production, but is also necessary to reduce the impacts of water quality degradation. (USBR)
W73-11509

CROP RESPONSE TO TRICKLE AND SUBSURFACE IRRIGATION,
Texas A and M Univ., College Station.
E. A. Hiler, and T. A. Howell.
Paper 72-744, 1972 Annual Meeting American Society of Agricultural Engineers, Chicago, Ill, Dec 1972. 22 p, 6 fig, 3 tab, 18 ref.

Descriptors: *Crop response, *Irrigation efficiency, *Subsurface irrigation, *Trickle irrigation, Consumptive use, Evapotranspiration, Growth rates, Lysimeters, Irrigation practices, Irrigation systems, Irrigation water, Mist irrigation, Wind speed, Moisture content, Sorghum, Surface irrigation, Bibliographies, Crop production.

An investigation was conducted to compare water-use efficiencies using different irrigation methods, and to evaluate effects of reduced irrigation amounts on yields using trickle irrigation. Grain sorghum was grown during 1971-72 in a field lysimeter installation where complete control of the soil water could be maintained. Irrigation treatments included subsurface, trickle, subsurface plus mist, trickle plus mist, and surface. Water measurements were made to determine irrigation amount, storage depletion, and drainage amount, so that total crop water use could be determined. Trickle and mist treatment resulted in the highest water efficiencies. The increase in water-use efficiency based on total water use was 42% for trickle treatment compared to surface treatment. Grain sorghum growth as indicated by crop height and leaf area index was greater for all 1971 intensive treatments than for the surface treatment. Comparison of 3 levels of trickle irrigation amounts in 1972 indicates that water-use efficiency increased by 50% with sparing trickle applications. (USBR)
W73-11513

WATER INFILTRATION UNDER CENTER--PIVOT SPRINKLERS,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 08B.
W73-11514

THE ORIGIN AND DOMESTICATION OF SORGHUM BICOLOR,
Illinois Univ., Urbana. Dept. of Agronomy.
J. M. J. DeWet, and J. R. Harlan.
Econ Bot. Vol 25, No 2, p 128-135. 1971. Illus.
Identifiers: Distribution patterns, Domestication, *Morphological variability, *Sorghum-Bicolor-M.

The distribution, morphological variability, affinities and ethnobotany of Sorghum varieties are discussed. The wild representatives of S. bicolor are strictly African in distribution. Descriptions are given of the different races. S. bicolor is an exceptionally complex sp. Cultivated sorghum is grown in regions with 10-120 in. annual rainfall. Sorghum was probably introduced into China some time after the beginning of the Christian era. Sorghum is absent from excavated early farming sites in the Near East. It may have been introduced into India from Africa by the end of the 2nd millenium B.C. Sorghum domestication may have been accomplished soon after agriculture was introduced into Bantu Africa.--Copyright 1972, Biological Abstracts, Inc.
W73-11561

FINANCING PRIVATE WATER RESOURCE DEVELOPMENT: ANALYSIS OF A STATE LOAN PROGRAM,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
T. L. Dobbs, C. E. Olson, W. G. Wedemeyer, and G. H. Pfeiffer.
Water Resources Bulletin, Vol 9, No 1, p 129-139, February, 1973. 4 fig, 2 tab, 10 ref.

Descriptors: Water resources development, *Financing, *Investment, Economic feasibility, *Sprinkler irrigation, *Wyoming, *Irrigation programs, Agriculture, Farms, Regional development.
Identifiers: Economic analysis, *State loan programs, Firm growth, Forage crops, Groundwater development, Feasibility analysis.

Resulting from a marked decline in Federally financed water resources development, Western States are looking increasingly inward for support of irrigation projects. A State loan program is analyzed for its effects on groundwater development in Wyoming. The analysis focuses on the effects of low-interest State financing on the economic feasibility of investments in center-pivot sprinkler irrigation systems. The feasibility analysis indicates that investments in sprinkler systems for production of cash crops are highly profitable, and would frequently be carried out whether or not the State loan program were available. Investments in sprinklers for production of forage crops are perhaps frequently made attractive by the loan program. Thus, while the program appears to have accelerated the pace of private water resource development in Wyoming, it has also subsidized some investments that would have been carried out regardless of the program's existence. Further analysis indicates that sprinkler investments carried out with State financing contribute substantially to firm growth when cash crops are grown, but have less marked, and sometimes negative, effects on growth when forage crops are produced. Some positive effects of the loan program on southeast Wyoming's regional economy are noted, but a complete empirical analysis of regional impacts is beyond this study's scope. (Bell-Cornell)
W73-11686

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-11089

VIRGINIA SMALL STREAMS PROGRAM, PRELIMINARY FLOOD-FREQUENCY RELATIONS,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 02E.
W73-11090

KARST LANDSCAPES AND KARST FORMS (KARSTOVYYE LANDSHAFTY I TIPY KARSTA),
Moscow State Univ. (USSR). Kafedra Fizicheskoi Geografii.
N. A. Gvozdetskiy.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 5, p 16-22, September-October 1972. 26 ref.

Descriptors: *Karst, *Karst hydrology, Geomorphology, Drainage effects, Soils, Vegetation, Subtropic, Tropic.
Identifiers: USSR, *Karst topography, *Cuba.

A karstland is a unique physiographic complex and geographical landscape. The extent to which karst rocks and karst processes influence the landscape is determined by whether karst rocks outcrop directly at the surface of the ground, are covered with soil, or are overlain by nonkarstic material. Landscape features are most affected by denuded karst and least affected by buried or fossil karst. Karst studies made in Cuba in 1971 have shown that, in addition to mogotes (residual hills in the tropics), there are morphological and genetic forms of karst which must be considered as special tropical forms, despite their similarity to karst of temperate zones. (Josefson-USGS)
W73-11102

PROTECTION AND CONTROL OF THE SALT WATER SHORE AREA.
Rhode Island Statewide Planning Program, Providence.
For primary bibliographic entry see Field 06E.
W73-11114

UNSUPERVISED SPATIAL CLUSTERING WITH SPECTRAL DISCRIMINATION,
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.
For primary bibliographic entry see Field 07C.
W73-11116

ITERATIVE SIMULATION ALGORITHM IN RESERVOIR SYSTEMS OPERATION,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
T. P. Chang, and G. H. Toebes.
Paper presented at International Association of Hydraulic Research. 1973. 8 p, 2 fig, 6 ref. OWRR-A-026-IND (1).

Descriptors: *Reservoir operation, *Reservoir storage, *Simulation analysis, *Multiple purpose reservoirs, *Flood control, *Water supply, Model studies.

For the operation of a multi-unit reservoir system with many control centers (check points, or feedback points, etc.) the building of a true systems policy leads to solving a very large set of many simultaneous, constrained equations. This problem is a key difficulty in building a systems operating policy. This paper relates how it can be solved in a trial and error fashion by an especially developed algorithm, which is called the 'iterative simulation algorithm'. It is applicable to systems policies for large numbers of reservoirs both in series as well as in parallel.
W73-11139

STOCHASTIC RESERVOIR MANAGEMENT AND SYSTEM DESIGN FOR IRRIGATION,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 03F.
W73-11152

SOIL PHYSICAL FACTORS AFFECTING ROOT MORPHOLOGY AND STABILITY OF SCOTS PINE ON UPLAND HEATHS,
M. E. Faulkner, and D. C. Malcolm.
Forestry. Vol 45, No 1, p 23-36, 1972. Illus.
Identifiers: England, Morphology, Physical properties, *Pine-G, Pinus-Sylvestris-G, *Roots, Soils, Stability, Upland heaths.

Forty trees, on 5 heathland soil types, were pulled over and their resistance compared with described profile and physical features. Root morphology was found to be important for stability as was stem weight and soil strength. Ironpans reduce permeability to vertical drainage and delay but do not bar limited root penetration to the lower horizons. Root extension ceases at soil densities of about 1.5 g/cc. On freely rooted profiles root systems may continue to expand but on ironpan soils have occupied available space (at 30 yr) and further increases in tree size will result in increased instability.--Copyright 1972, Biological Abstracts, Inc.
W73-11173

STEADY-STATE SEEPAGE IN A HILLSIDE,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 02G.
W73-11212

FREEZE-FREE (32 F) SEASONS OF THE MAJOR BASINS AND PLATEAUS OF NEVADA,
National Weather Service, Reno, Nev. Weather Service Office.
For primary bibliographic entry see Field 07C.
W73-11218

PUBLIC PARTICIPATION IN URBAN WATER PLANNING,
Fort Lewis Coll., Durango, Colo.
For primary bibliographic entry see Field 06B.
W73-11257

THE ESTIMATION OF THE HYDROLOGICA IMPACT OF URBANIZATION: AN EXAMPLE OF THE USE OF DIGITAL SIMULATION IN HYDROLOGY,
University Coll., London (England).
For primary bibliographic entry see Field 04C.
W73-11259

MOBILE AREA WATER TRANSPORTATION STUDY OF MOBILE, BALDWIN AND ESCAMBIA COUNTIES, ALABAMA.
Tippetts Abbett McCarthy Stratton, New York.
For primary bibliographic entry see Field 08A.
W73-11260

RIVER SYSTEMS TRANSITION FUNCTION AND OPERATION STUDY,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Resources Planning.
C. Liu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Proceedings paper 9806, p 889-900, June, 1973. 5 fig, 5 ref.

Descriptors: *Simulation analysis, *Reservoir operation, *River systems, *Hydraulics, *Water resources, *New York, Multiple-purpose projects, Management, Reservoir releases, Storage, Computer programs, Flow, Streams, Diversion, Canals, Lakes, Mathematical models, Systems analysis, Equations.
Identifiers: *Oswego River System.

Presented is the mathematical basis of a reservoir-river systems operation, and its application to the systems conservation operations analysis. A relatively simple algorithm is developed to solve it. The 'level-number' technique is further extended to handle water reallocation schemes more flexibly. A completely general and flexible computer program which can be used to investigate a variety of management policies as well as various system configurations is developed as a result. A general and compact representation of the interaction of storage, release, and diversion operations is described. For any system configuration, the systems transition function has the same form; the difference between reservoir systems is reflected solely in the elements of the A matrix, the system configuration matrix, in the function. The systems conservation operation functions are derived from it and with relatively simple programming, the method can be applied to large scale systems conservation analysis. The storage reallocation method is formulated to handle linear and nonlinear operating rules. A multipurpose operation of the Oswego River System, a canal-river system with eight lakes, provides a case study for testing the computation procedures. (Bell-Cornell)
W73-11364

DISCRETE GRADIENT OPTIMIZATION OF WATER SYSTEMS,
Medical Univ. of South Carolina, Charleston. Dept. of Biometry.
For primary bibliographic entry see Field 08B.
W73-11365

PROBABILISTIC SHORT-TERM RIVER YIELD FORECASTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges, and A. E. Johnson.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR2, Proceedings paper 9785, p 143-155, June, 1973. 4 fig, 6 tab, 8 ref.

Descriptors: *Rivers, *River flow, *Streamflow forecasting, Hydrology, *Stochastic processes, *Regression analysis, *Inflow, Probability, Seasonal, Reservoir operation, Equations, Mathematical models, Systems analysis.

A predictive model, employing a first order autoregressive structure, which enables estimation of the probability distributions of streamflow volumes in future seasons, is developed. The model is applicable to streams that have intraseasonal runoff volumes describable by lognormal probability distributions. A season long observation provides the initial value which is propagated through future seasons by the first order autoregressive streamflow volume structure. For high interseasonal (lag one) correlations, application of the model yields valuable forecasts for as many as ten time periods in the future, while for low correlations such forecasting is of no additional value after four time periods. The method has greatest utility for streams having high variability and distinct seasonality. (Bell-Cornell)
W73-11366

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-11399

HYDROLOGY AND WATER RESOURCES DEVELOPMENT IN NEPAL,
Geological Survey, Washington, D.C.

W. W. Evett.
Available from NTIS, Springfield, Va 22151 as PB-212 035 Price $3.00 printed copy; $0.95 microfiche. Open-file report, June 1969. 104 p, 16 fig, 4 tab, 18 ref.

Descriptors: *Water resources, *Water resources development, *Foreign research, Surface waters, Groundwater, Hydrologic data, Streamflow, Water balance, Water yield.
Identifiers: *Nepal.

The water resources potential of Nepal were surveyed on a countrywide basis. By 1969, a nationwide network of hydrological stations had been established for the collection of streamflow, sediment and meteorological data, and groundwater exploration was started in the Terai Belt. Average annual runoff in Nepal is more than adequate to meet existing needs for basic water supply, and a large potential exists for hydropower and irrigation development from the rivers. During the monsoon season, from the middle of June to late September, flooding commonly occurs in low-lying areas. In the late dry season, March to the middle of June, runoff is deficient in many areas of the country. Tube wells are the more suitable approach to supplying irrigation requirements in the Terai Belt, at least in the near future. Factors that affect the overall development of the water resources potential of the river basins in Nepal are discussed in detail. (Knapp-USGS)
W73-11401

EFFECTS OF URBANIZATION ON FLOODS IN THE HOUSTON, TEXAS, METROPOLITAN AREA,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04C.
W73-11402

MATHEMATICAL METHODS IN THE THEORY AND PRACTICE OF MOUNTAIN STREAMFLOW COMPUTATION AND FORECASTING (MATEMATICHESKIYE METODY V TEORII I PRAKTIKE RASCHETOV I PROGNOZOV STOKA GORNYKH REK).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

Sredneaziatskiy Regional'nyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 1 (82), Yu. M. Denisov and Yu. N. Ivanov, editors, Leningrad, 1972. 208 p.

Descriptors: *Mathematical studies, *Rainfall-runoff relationships, *Mathematical models, *Mountains, *Streamflow forecasting, Model studies, Streamflow, Runoff, Floods, Hydrographs, Statistical models, Routing, Probability, Stochastic processes, Statistical methods, Correlation analysis, Regression analysis, Hydrologic data, Analytical techniques, Curves, Equations, Fluctuations.
Identifiers: USSR, Deterministic models, Stochastic models.

This collection contains 20 papers presented at the All-Union Symposium on the Use of Mathematical Methods in the Theory and Practice of Mountain Streamflow Computation and Forecasting, held in Tashkent, October 20-24, 1970. Deterministic and stochastic models are described in the application of hydrologic techniques to forecasting of runoff. (Josefson-USGS)
W73-11406

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION - PHASE I,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 05D.
W73-11424

THE EFFECTS OF DITCHING ON THE MOSQUITO POPULATIONS IN SOME SECTIONS OF JUNCUS SALT MARSH IN CARTERET COUNTY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Entomology.
R. N. LaSalle, and K. L. Knight.
Available from the National Technical Information Service as PB-221 589, $3.00 in paper copy, $0.95 in microfiche. University of North Carolina Water Resources Research Institute Report No 82, June 1973. 162 p, 57 fig, 55 tab, 14 ref. OWRR B-027-NC (1), 14-31-0001-3316.

Descriptors: Mosquitoes, *Insect control, Vectors biological, Diptera, *Pest control, *North Carolina.
Identifiers: *Ditching, *Mosquito control.

Five areas of irregularly flooded salt marsh were studied to determine effects of ditching on mosquito populations. Principal species were Anopheles atropos Dyar and Knab, Anopheles bradleyi King, Aedes sollicitans (Walker) and Aedes taeniorhynchus (Weidemann). Present in lesser numbers were Culex salinarius Coquillett and Psorophora confinnis (Lynch Arribalzaga). Data on both plant cover and on the abundance of mosquito larvae showed such wide variation in both ditched and unditched sections that no significant differences between sections could be detected. Aedes and Psorophora larvae were more commonly collected from sites marginal to marsh, whereas Anopheles and Culex were more evenly distributed throughout study areas. Percentage of Aedes and Psorophora larvae taken in samples tended to be directly proportional to mean slope of the breeding depression and inversely proportional to its frequency of flooding. Conversely, the relative abundance of Anopheles and Culex species was directly proportional to the frequency of flooding. Relative abundance of species in the ditched sites was more affected by the mean slope, frequency of flooding and the ratio of frequency of flooding/mean slope than in the unditched sites. (Howells-North Carolina)
W73-11431

THE EFFECT OF ENVIRONMENTAL FACTORS ON WOOD CHARACTERISTICS: I. THE INFLUENCE OF IRRIGATION ON PINUS RADIATA FROM SOUTH AUSTRALIA,
J. W. P. Nicholls.
Silvae Genet. Vol 20, No 1/2, p 26-33, 1971. Illus.
Identifiers: *Australia (Mt. Crawford), Cells, Environmental studies, Fertilizers, Irrigation, *Pinus-Radiata-G, Tracheid, *Wood characteristics, Supplementary watering.

Specimens from 32 trees of P. radiata from 3 sites at Mt. Crawford were examined. Densitometric information and results for average tracheid length were collected from the last 10 successive growth rings in each tree. These data were analyzed to show the effect of supplementary watering and fertilizer treatment. The proportion of thickwalled cells associated with summer and autumn growth was increased from approximately 20% to 30%. Average tracheid length was not affected by supplementary watering. The changes in wood quality are not regarded as adverse and therefore the effect of the irrigation program is to increase the amount of acceptable wood.--Copyright 1972, Biological Abstracts, Inc.
W73-11452

PROGRESS REPORT OF RESIDUE STUDIES ON ORGANIC ARSENICALS USED FOR DITCHBANK WEED CONTROL,
Bureau of Reclamation, Denver, Colo.
H. A. Salman, T. R. Bartley, and A. D. Summers.
Bureau of Reclamation Report REC-ERC-72-37, Nov 1972. 8 p, 7 tab, 18 ref.

Descriptors: *Weed control, *Herbicides, Arsenic compounds, Chemical analysis, Irrigation canals, Irrigation water, Water quality, Water analysis, Johnsongrass, Irrigation, Irrigation operation and maintenance, Irrigation systems, Bibliographies, Rio Grande River, On-site investigations.
Identifiers: *Rio Grande Project, Arsenic.

Monosodium methanearsonate (MSMA) was applied to the ditchbanks of full and dewatered irrigation systems on the Rio Grande Project to control ditchbank weeds and to determine the MSMA residues in irrigation water. Information obtained will provide support for the registration of organic arsenicals used for weed control along full and/or dewatered ditchbanks. Water samples were analyzed for total arsenic content after sulfuric-nitric acid digestion by the silver diethyldithiocarbamate method. Maximum arsenic concentrations found in the first water released through dewatered laterals were 0.54, 0.12, and 0.29 ppm, dropping below the mandatory US Public Health Service Drinking Water Standards for arsenic within 10 min. Maximum arsenic concentrations in full canal systems following MSMA herbicide application to ditchbanks were 0.16, 0.17, and 0.86 ppm, but dropped rapidly after a period of time. Test results show that low levels of arsenic occur in irrigation water for short periods of time following ditchbank applications of MSMA. Theoretical calculations indicate that from 0.002 to 0.04 lb of arsenic per acre per treatment could reach the farmland during a 24-hr period using 6 in. of irrigation water. (USBR)
W73-11497

THE IMPACT OF WEATHER MODIFICATION ON U.S. PLANNING FOR THE RIO COLORADO AND RIO GRANDE,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 03B.
W73-11505

HYDRAULIC DESIGN OF STILLING BASIN FOR PIPE OR CHANNEL OUTLETS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08B.
W73-11533

CITY OF ALBUQUERQUE SANDIA FOOTHILLS DRAINAGE.
O'Brien (Ken) and Associates, Albuquerque, N. Mex.

October 1971. 128 p, 24 fig, 6 tab, 68 ref, 3 append.

Descriptors: *Drainage systems, *Evaluation, Technology, Environmental effects, Water rights, Infiltration, Pit recharge, Water spreading, New Mexico, Rio Grande River, Controlled drainage, Drainage water.
Identifiers: *Sandia Foothills (New Mexico).

Since 1952, several drainage studies have been performed for the East Mesa of Albuquerque, New Mexico. This study focuses on the alluvial fans at the base of the Sandia Mountains on the East Mesa, and covers an area of 1 mile by 5 1/2 miles. Several alternatives were examined including interception of the runoff to the Tijeras Arroyo through open channels and undergroundpipes, and the interception of all runoff for infiltration. This would involve the use of detention basins, spreading grounds, recharge wells, recharge pits and other facilities. These two major alternative systems were examined by considering technical, economic and environmental considerations. The system to divert the water to the Tijeras Arroyo was favored because: (1) technically, it was felt to be more reliable than the capturing and infiltration of runoff; (2) economically, it would have a lower initial cost; and (3) environmentally, infiltration of runoff presented problems of possible ground water contamination. There is the possibility of perched water tables in conjunction with spread-

ing grounds and recharge pits, and recharge wells present the possibility of causing earthquake activity. Furthermore, New Mexico is a member of the Rio Grande Water Compact, and any water which is diverted from its normal flow to the Rio Grande would have to be replaced, and infiltration holds no real advantage in providing water supplies to the area. (See also W73-11669) (Poertner)
W73-11668

SUPPLEMENT TO CITY OF ALBUQUERQUE SANDIA FOOTHILLS DRAINAGE STUDY.
O'Brien (Ken) and Associates, Albuquerque, N. Mex.

March 1972. 31 p, 3 fig, 1 tab.

Descriptors: *Drainage systems, *Evaluations, *Flood control, *Infiltration, Controlled drainage, Economics, Environmental effects, Groundwater pollution, New Mexico, Ponding, Recharge, Recharge ponds, Pit recharge, Land forming, Water management (Applied).
Identifiers: *Albuquerque (New Mexico), Sandia Foothills.

The proposed drainage requirements of the Albuquerque Metropolitan Arroyo Flood Control Authority were examined to determine their general effectiveness and their effect on drainage system suggestions made previously for the Sandia Foothills in Albuquerque. In the previous study (See W73-11668) it was recommended that a system of open channels and underground pipes be used to convey the runoff to an outlet instead of retaining the water for infiltration. However, the proposed flood control authority policy and the basic strategy of reducing flooding by detaining and infiltrating runoff rather than disposing of it quickly. Limits were set on the maximum impervious area, and developments are to provide areas for the infiltration of all runoff from impervious areas, including rooftops, paved areas and streets. Design is to be based on the 100-year storm runoff, and infiltration areas could be used as open space recreational areas and be dedicated to the City. Many of the proposed requirements were based on worthwhile motives, but there were serious objections. The infiltration of urban runoff could cause serious pollution problems. Also, the requirements would make maintenance the responsibility of the private owner, and might be neglected. The proposed changes were more costly than the alternative drainage system--from $330,000 to $1 million more than the original cost of $3.68 million. (Poertner)
W73-11669

REDUCTION OF HYDRALIC SEWER LOADINGS BY DOWNSPOUT REMOVAL,
Springfield Sanitary District, Ill.
G. L. Peters, and A. P. Troemper.
Journal of the Water Pollution Control Federation, Vol 41, No 1, p 63-81, January, 1969. 12 fig, 7 tab.

Descriptors: *Flood control, *Sewerage, Storm water, Storm runoff, Controlled drainage, Storm drains, Urban drainage, Drainage systems, Sewers, Drainage programs, Drainage engineering, Drainage water, Water management (Applied), Roofs.
Identifiers: *Roof drain removal.

The removal of roof drains from the sewer system can markedly reduce sewer loading and flooding. Realizing this, the Springfield Sanitary District had an ordinance in effect since 1926 to prohibit such connections. However, there was no enforcement of this ordinance, and the problems of sewer overloading and flooding became worse. In 1948, a program was developed for the removal of these roof drains. But geographical limitations on the authority of the District prevented any real progress against the major problems of flooding in the city. A 1963 act of the Illinois Legislature expanded the authority of the Sanitary District and a new downspout removal program was begun in April of 1966, to last for 2 full years. The city was divided into districts and all buildings were checked by inspectors. During inspection, it was assumed that all drains discharging underground were illegal connections. After inspecting 25,527 buildings, 40 percent were found to be in violation. These people were sent letters advising them of their violation and suggested methods of compliance. Second inspections were made and initial compliance was over 50 percent. Further letters implying legal action and appeal to public spirit were sent. Eventually, all but 5 percent of all buildings complied with the law. Some of these were allowed to retain their connections because of hardship cases. The cost of removal in most cases was estimated at $5 to $100. The program was deemed very effective, not only in reducing flooding but, also, for reducing the amount of water put through the sewage treatment plant. (Poertner)
W73-11671

4B. Groundwater Management

GROUND WATER RECHARGE THROUGH PITS AND WELLS,
Kansas Water Resources Research Inst., Manhattan.
H. L. Manges.
Available from the National Technical Information Service as PB-221 329, $4.75 in paper copy, $0.95 in microfiche. Contribution Number 82, May 1973. 43 p, 10 fig, 5 tab, 29 ref. OWRR A-021-KAN (2). 14-01-0001-1084.

Descriptors: *Groundwater recharge, *Pit recharge, *Recharge wells, *Filtration, Drainage, Hydrology, Aquifers, Aquifer characteristics, Water treatment, Water purification, Water resources, *Kansas.
Identifiers: *Filter fabrics.

Well water was successfully recharged to the Meade formation in Southcentral Kansas through a pit and a well. However, when surface runoff water was recharged, the surface of the pit became sealed over for all practical purposes and the specific capacity of the well was reduced from 44 to 31 gallons per minute per foot of drawdown. Recharging of the aquifer appears feasible provided the water is of high quality. In laboratory filtration studies, the turbidity of a slurry made up from tap water and topsoil was lowered from 30 to less than 10 Jackson Turbidity Units (JTU) by passing it through filter cloths. The filter cloth served only as a septum upon which a cake formed and the turbidity was reduced by the forming filter cake. Flow rates after 24 hours varied from 0.10 to 0.34 gallons per minute per square foot and are comparable to flow rates through slow sand filters.
W73-11053

GROUNDWATER DATA IN THE CORVALLIS--ALBANDY AREA, CENTRAL WILLIAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
F. J. Frank, and N. A. Johnson.
Oregon State Engineer Groundwater Report No 17, November 1972. 46 p, 3 fig, 3 tab, 11 ref.

Descriptors: *Groundwater resources, *Water wells, *Well data, *Oregon, *Basic data collections, Water level fluctuations, Aquifers, Drillers logs, Pumping, Water yield, Drawdown, Water utilization, Water quality, Chemical analysis, Hydrographs, Maps.
Identifiers: *Corvallis-Albany area (Oreg), Central Willamette Valley (Oreg).

Basic records of representative existing wells, water levels, and chemical quality of groundwater are presented for the Corvallis-Albany area, Oregon. Most of the high-yield wells produce water from alluvial (sand and gravel) aquifers that underlie the main valley plain or that are coextensive with the present flood plain of the Willamette River. Hydrographs show fluctuations of water levels during 1962-72 in nine selected wells. Water levels are highest during the wet winter and spring months and lowest during the dry summer and autumn months. Well data are tabulated for 415 representative wells whose locations are shown on a map. Most of the data were obtained from well-drillers' reports submitted to the office of the Oregon State Engineer; some of the data were supplied by the well owners or operators. Chemical analyses are tabulated for water samples from 27 wells. Water analyses for 21 wells were made by the U.S. Geological Survey and the rest by commercial or State laboratories. (Woodard-USGS)
W73-11093

GROUNDWATER REGIME IN THE ZONE OF INFLUENCE OF PUMPING (REZHIM GRUNTOVYKH VOD V ZONE VLIYANIYA VERTIKAL'NOGO DRENAZHA),
Bukharskaya Selskokhozyaistvennaya Opytnaya Stantsiya (USSR).
A. G. Kim.
Gidrotekhnika i Melioratsiya, No 6, p 74-76, June 1971. 4 fig.

Descriptors: *Groundwater, *Pumping, Water table, Water level fluctuations, Leaching, Salts, Wells, Observation wells, Curves.
Identifiers: *USSR (Bukhara Oblast).

The groundwater regime in the zone of influence of pumping was investigated in 1967-68 at the Kagan State Farm, Kagan Rayon, Bukhara Oblast. The groundwater regime was studied in a test area covering 450 hectares and containing 5 wells dug to a depth of 25 m and equipped with perforated pipes 325 mm in diameter. Groundwater level measurements were made at 37 observation wells every 5-10 days and daily during leaching to remove salts. Groundwater levels were also measured in the spring and fall at 68 temporary observation wells. Depth of groundwater occurrence in the zone of influence is 1 m greater than in an unaffected area. Deep occurrence of groundwater in the zone ensures adequate leaching of salts from the soil and reduces the salinity hazard. With a well discharge of 20 liter/sec, pumping effects extend over a distance of 300 m, and groundwater within the radius of influence remains consistently at a depth of 440-510 cm. (Josefson-USGS)
W73-11094

GROUND WATER IN FINNEY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-11106

GROUNDWATER LEVELS IN NEBRASKA, 1972,
Geological Survey, Lincoln, Nebr.
M. J. Ellis.
Nebraska Water Survey Paper No 34, May 1973. 93 p, 10 fig, 1 tab.

Descriptors: *Groundwater, *Water levels, *Water wells, *Nebraska, Basic data collections, Hydrogeology, Water level fluctuations, Water utilization, Withdrawal, Irrigation, Aquifer characteristics, Water supply, Groundwater recharge.

During 1972 the installation of irrigation wells in Nebraska continued at an active rate. Holt County, with 148 wells, again led other counties, followed by Custer County with 84 wells and Hamilton County with 80 well installations. Adams, Antelope, Boone, Buffalo, Clay, Frontier, Hall, Kearney, Merrick, Phelps, Red Willow, and York

Counties increased their number of wells by 50 or more. The cumulative total number of registered irrigation wells in the State through 1972 is 39,505. The following information is given for each well in the Statewide network of water-level observation wells: year of the earliest recorded water level; highest and lowest recorded water levels, in feet below land surface; a fall 1972 water-level measurement, in feet below land surface; the departure, in feet, of the fall 1972 water level from an assumed normal water level; and the change from previous fall, or net difference, in feet, between the fall 1972 and fall 1971 water-level measurements. (Woodard-USGS)
W73-11120

BEHAVIOR OF GROUNDWATER FLOW SUBJECT TO TIME-VARYING RECHARGE,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 02F.
W73-11142

GEOLOGY AND GROUND-WATER CHARACTERISTICS OF THE HANFORD RESERVATION OF THE U.S. ATOMIC ENERGY COMMISSION, WASHINGTON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-11204

STREAM DEPLETION FACTORS, ARKANSAS RIVER VALLEY, SOUTHEASTERN COLORADO: A BASIS FOR EVALUATING PLANS FOR CONJUNCTIVE USE OF GROUND AND SURFACE WATER,
Geological Survey, Lakewood, Colo.

Open-file report, November 1972. 8 p, 5 fig, 4 map, 1 tab, 12 ref.

Descriptors: *Water resources development, *Surface-groundwater relationships, *Withdrawal, *Groundwater recharge, *Colorado, Watershed management, Water utilization, Analog models, Mapping, Streamflow forecasting, Maps, Hydrology, Hydrogeology.
Identifiers: *Arkansas River Valley (Colo).

The Arkansas River valley in Colorado is a stream-aquifer system that consists of the Arkansas River and the associated valley-fill deposits. The history of delivery of irrigation water by canals indicates that the supply has been inadequate during some seasons and some years. The shortage can be reduced by carefully designed conjunctive use of ground and surface water. An analog model of the Arkansas River valley in Colorado was constructed to facilitate such designs (Moore and Wood, 1967). The purpose of this report is to make hydrologic maps available to water managers and planners. The maps are useful for estimating the changes in streamflow caused by recharge to or withdrawal of ground water from the valley-fill aquifer between Pueblo, Colo., and the Kansas State line. Use of maps and a concept described will assist planners and managers in their task of providing timely delivery of water to the users and in the administration of water laws. (Woodard-USGS)
W73-11221

WATER RESOURCES OF HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
A. H. Ludwig.
Available for sale by GPO, Washington, D.C. 20402, Price $4.00. Water-Supply Paper 1998, 1972. 41 p, 9 fig, 5 plate, 10 tab, 23 ref.

Descriptors: *Water resources, *Groundwater resource, *Surface waters, *Hydrologic data, *Arkansas, Basic data collections, Water wells, Aquifer characteristics, Water yield, Streamflow, Flow rates, Water quality, Chemical analysis, Hydrogeology, Water utilization, Water supply, Low-flow frequency, Flood frequency, Water levels.
Identifiers: *Red River Valley (Ark), Hempstead County (Ark), Lafayette County (Ark), Little River County (Ark), Miller County (Ark), Nevada County (Ark).

The five-county area in southwest Arkansas that consists of Hempstead, Lafayette, Little River, Miller, and Nevada Counties possesses abundant water resources. Nearly all water supplies are obtained from groundwater. Surface water is used primarily for municipal supply at Texarkana and for industrial supply at a papermill near Ashdown. The aquifers of Cretaceous age are the principal sources of freshwater in northern Hempstead and Nevada Counties, where wells yield as much as 300 gpm of good quality water from depths as great as 1,200 feet. Aquifers of Tertiary age are good sources of water in Miller and Lafayette Counties and in southeastern Nevada County. Terrace deposits of Quaternary age are good sources of water in Little River and Lafayette Counties. The Red River is the largest source of surface water in the project area. It drains about 48,000 square miles upstream from the area and has an average flow of 12,180 cfs. The principal reservoirs in the area are Millwood Reservoir on Little River (capacity, 1,858,000 acre-feet) and Lake Erling on Bodcau Creek (capacity, 49,000 acre-feet). More than 5,500 lakes and farm ponds of 5 acres or less have a combined storage capacity of more than 14,000 acre-feet. Water in the Red River is high in chloride and dissolved solids and, consequently, is chemically unsuitable for most uses unless treated. (Woodard-USGS)
W73-11222

SCOPE OF PUBLIC WATER SUPPLY NEEDS.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 06D.
W73-11245

EMERGING WATER SUPPLY TECHNOLOGY.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 03D.
W73-11246

ARTIFICIAL RECHARGE OF GROUNDWATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 479, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-202, February 1973. 309p.

Descriptors: *Artificial recharge, *Bibliographies, *Groundwater recharge, *Pit recharge, *Recharge wells, Aquifers, Conjunctive use, Injective wells, Reclaimed water, Saline water intrusion, Water management (Applied), Water reuse, Withdrawal.

This report, containing 210 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 50,631 abstracts covering SWRA through December 15, 1972 (Volume 5, Number 24). Author and subject indexes are included. (OWRR)
W73-11321

WATER RECORDS OF THE U.S. VIRGIN ISLANDS, 1962-69,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W73-11396

GROUND-WATER BASIC DATA OF CAVALIER AND PEMBINA COUNTIES,
Geological Survey, Bismarck, N. Dak.
R. D. Hutchinson.
North Dakota Geological Survey Bulletin 62, Part II. and North Dakota Water Commission County Ground-Water Studies 20, Part II, 1973. 606 p, 29 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *North Dakota, Water utilization, Hydrologic data, Basic data collections, Water wells, Well data, Chemical analysis, Water supply, Municipal water, Domestic water, Livestock, Industrial water, Irrigation water.
Identifiers: *Cavalier and Pembina Counties (N Dak).

The purpose of the hydrologic investigation in Cavalier and Pembina Counties, N. Dak., was to determine the quantity and quality of groundwater available for municipal, domestic, livestock, industrial, and irrigation uses. Specifically, the objectives were: (1) determine the location, extent, and nature of the major aquifers; (2) evaluate the occurrence and movement of groundwater, including the sources of recharge and discharge; (3) estimate the quantities of water stored in the aquifers; (4) estimate the potential yields to wells tapping the major aquifers; and (5) determine the chemical quality of the groundwater. The information was collected chiefly between 1968 and 1971, and contains: (1) geologic and hydrologic data for 2,286 wells, test holes, and springs; (2) water level measurements in 125 observation wells; (3) lithologic and geophysical logs of about 886 test holes and wells; (4) chemical analyses of 296 water samples; (5) particle-size analyses of material from various aquifers; and (6) the hydraulic conductivity of materials from various depths and locations. (Woodard-USGS)
W73-11397

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-11399

HYDROLOGY AND WATER RESOURCES DEVELOPMENT IN NEPAL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-11401

HYDROLOGY OF TRUCKEE MEADOWS, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
R. L. Cooley, J. W. Fordham, and J. A. Westphal.
Available from the National Technical Information Service as PB-221 539, $3.00 in paper copy, $0.95 in microfiche. Nevada Water Resources Research Institute, Reno, Project Report No 15, October 1971. 49 p, 6 fig, 4 plate, 4 tab, 17 ref, 1 append. OWRR A-034-NEV (1).

Descriptors: *Water resources, *Hydrology, *Irrigation water, *California, *Nevada, Governments, Surface waters, Groundwater, Water quality, Water demand, Water supply, Watershed management, Model studies, Hydraulic models.
Identifiers: *Truckee Meadows (Nev).

The States of California and Nevada and the federal government are involved in the fate of Pyramid Lake and the Newlands Irrigation pro-

ject. Truckee Meadows, which lies at the base of the Carson Range (a spur of the Sierra Nevada) approximately 30 miles northeast of Lake Tahoe, was studied with regard to its potential as a source for additional water for the system. Using the groundwater model, groundwater inflow to the Meadows from areas peripheral to the basin was estimated to be about 5,000 acre-feet per year (ac-ft/yr). However, using reasonable extremes for transmissivities, the model indicates inflow could range from 2,000 to 8,000 ac-ft/yr. The estimated recharge rate includes underflow from tributary valleys, recharge on alluvial fans and slopes, and underflow from the bordering mountain ranges. Underflow out of Truckee Meadows occurs in the vicinity of Vista and is apparently less than 10 ac-ft/yr. Mining groundwater in the Meadows would yield about 2 feet of water per 10 feet of saturated material per unit area based on an estimated average specific pumping carries several risks which could overshadow any benefits. Lowering water levels in areas of groundwater discharge will increase hydraulic gradients toward the discharge areas and will likely induce movement of poorer quality water into pumpage areas. (Woodard-USGS)
W73-11430

OXYGEN--A MAJOR ELEMENT IN DRILL PIPE CORROSION,
Shell Development Co., Houston, Tex.
For primary bibliographic entry see Field 08G.
W73-11453

CORROSION OF METALS IN TROPICAL ENVIRONMENTS--COPPER AND WROUGHT COPPER ALLOYS,
Naval Station, Canal Zone. Fuel Div.
For primary bibliographic entry see Field 08G.
W73-11455

TYPICAL LOG-CURVE SHAPES INDICATE FORMATION CHARACTERISTICS,
Dresser Industries, Inc., Houston, Tex.
For primary bibliographic entry see Field 08A.
W73-11456

OIL FIELD TECHNIQUES USED TO INCREASE FLOW IN COMMUNITY WATER WELL,
For primary bibliographic entry see Field 08A.
W73-11465

OPTIMUM HOLE DIAMETER FOR WATER WELLS,
For primary bibliographic entry see Field 08A.
W73-11468

SALINITY CONTROL ON A BOREHOLE SOURCE IN BUNTER SANDSTONE,
East Shropshire Water Board (England).
A. E. J. Edwards.
Institution of Water Engineers Journal, Vol 26, No 3, p 170-174, May 1972. 2 fig, 1 tab.

Descriptors: Saline water, Wells, Water wells, *Salinity, Chlorides, Sandstones, Logging (Recording), Municipal water, Water supply development, *Water yield improvement, Water sampling pumping.
Identifiers: Great Britain, *Salinity control.

Investigations into methods of reducing the high salinity of water abstracted from a borehole source are outlined. Auxiliary scavenger pumps were adopted as a solution and have resulted in a 55% reduction of the chloride content in the normal station output of 5450 cu. m/day. A gradually increasing abstraction had been accompanied by an increasing chloride content; by 1965, it had become obvious that further abstraction increases would only be possible if accompanied by remedial measures to reduce the level of chlorides put into supply. Some data on the pattern of inflow of saline water were gathered by investigations during 1965-1967. A solution based on these data was the installation of 'scavenger' pumps below the suction level of the main supply pumps, to abstract the high chloride water to waste. The scavenging system has proved most successful; regular sampling over the two-year period after installation has shown that low chloride levels can be maintained. (Smith-NWWA)
W73-11469

ARTIFICIAL RECHARGE IN THE WHITEWATER RIVER AREA, PALM SPRINGS, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
S. J. Tyley.
Geological Survey open-file report, January 30, 1973. 51 p, 18 fig, 10 tab, 18 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Imported water, *Aquifer characteristics, *California, Colorado River, Water chemistry, Hydrogeology, Infiltration, Mixing, Aquifers, Water wells, Well data, Drillers logs, Hydrologic data, Water quality.
Identifiers: *Palm Springs area (Calif).

Water levels in the Palm Springs, California, area declined as much as 75 feet from 1945 to 1970. To relieve this overdraft the two primary agencies responsible for water supply to the area, the Coachella Valley County Water District and the Desert Water Agency, contracted with the State of California to begin in 1973 to purchase water imported through the California Aqueduct. A study in the area revealed that the percolation basin method seems to be the most feasible way to recharge the proposed 61,000 acre-feet per year of imported Colorado River water in the Whitewater River area north of Palm Springs. The Windy Point area provides the most logical artificial recharge sites. No significant clay or silt layers exist in the alluvial fill to impede the downward movement of artificially recharged water to the water table. Infiltration rates in the Windy Point area ranged from 4 to 24 feet per day. A realistic long term average infiltration rate would be about 5 feet per day. Mixing in the aquifer system of the Colorado River water with native surface water and groundwater should have no detrimental effects on infiltration rates. The quality of the groundwater as affected by artificial recharge will depend on the ratios of quality and quantity of imported to local recharge water and on the degree to which the artificially recharged water mixes with the native water. (Woodard-USGS)
W73-11565

FINANCING PRIVATE WATER RESOURCE DEVELOPMENT: ANALYSIS OF A STATE LOAN PROGRAM,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-11686

4C. Effects on Water of Man's Non-Water Activities

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Washington, D.C.
L. J. Mansue, and P. W. Anderson.
Open-file report, 1973. 48 p, 11 fig, 8 tab, 21 ref.

Descriptors: *Sediment transport, *Land use, *New Jersey, *Urbanization, Agriculture, Land development, Sediment control, Reservoirs, *Sediment yield, Storm runoff, Particle size, Data collections, Geology, Topography, Water quality, Environmental effects.
Identifiers: Sediment-retention reservoirs.

The average annual rate of suspended-sediment discharge of the Stony Brook at Princeton, N.J. (44.5 square miles) is about 8,800 tons, or 200 tons per square mile. Annual yields within the basin, which is located in the Piedmont Lowlands section of the Piedmont physiographic province in west-central New Jersey, range from 25 to 400 tons per square mile. Storm runoff that transports suspended materials in excess of a ton carries 90% of the total suspended-sediment discharge from the basin. The suspended material carried during storms is about 55% silt, 40% clay, and 5% sand. Variations in sediment during the study (1956-70) are attributed to the integrated influence of several factors. A 2.9% decrease in croplands and an increase of 5.1% in idle and urban land use probably produced a net increase in sediment yields. Construction of seven sediment-retention reservoirs resulted in temporary increases in sediment yields. However, based on a trap-efficiency investigation at one site, the combined effect of operation of these seven reservoirs is estimated to result in a 20% reduction insediment discharge from the basin. (Woodard-USGS)
W73-11113

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS, METROPOLITAN AREA, 1971,
Geological Survey, Fort Worth, Tex.
B. B. Hampton.
Geological Survey Texas District open-file report, 1973. 77 p, 3 fig, 5 tab.

Descriptors: *Urbanization, *Urban hydrology, *Urban runoff, *Hydrologic data, *Texas, Floods, Flood frequency, Flood discharge, Environmental effects, Rainfall-runoff relationships, Basic data collections, Streamflow, Flow rates, Stream gages, Sediment transport, Turbidity, Hydrographs, Mass curves.
Identifiers: *Fort Worth area (Tex).

In October 1968, the Geological Survey in cooperation with the city of Fort Worth, Texas, Department of Public Works began a program of hydrologic investigations on several small streams in Fort Worth. The investigations are designed to evaluate factors affecting floods on small streams in the metropolitan area. Studies of additional streams, one of which drains beneath the impervious area of a shopping center, were added to the program in October 1969. The objectives are to (1) determine, on the basis of historical data and hydrologic analyses, the magnitude and frequency of floods; (2) document and define the areal extent of floods of greater than ordinary magnitude; and (3) determine the effect of urban development on flood peaks and volume. This report is the third in a series published annually for the Fort Worth area as part of a continuing program. The report presents the basic-hydrologic data collected in four study areas during the 1971 water year (October 1, 1970 to September 30, 1971). The four study areas within the metropolitan area are Sycamore Creek, Sycamore Creek tributary, Dry Branch, and Little Fossil Creek. The Sycamore Creek tributary study area includes the highly impervious area of the Seminary South Shopping Center as a subarea. (Woodard-USGS)
W73-11215

QUALITATIVE VALUES IN ENVIRONMENTAL PLANNING: A STUDY OF RESOURCE USE IN URBANIZING WATERSHEDS,
Harvard Univ., Cambridge, Mass., Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W73-11253

URBANIZATION'S DRAINAGE CONSEQUENCE,
Nolte (George S.) and Associates, San Jose, Calif.; and San Diego County Comprehensive Planning Organization, Calif.
P. O. Reimer, and J. B. Franzini.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 97, No UP2, p 217-237, December, 1971. 6 fig, 5 tab, 5 ref, 3 append.

Descriptors: *Flood control, *Channel improvements, *Computer programs, Flood plains, Urban land use, Watersheds (Basins), Cost comparisons, *California.
Identifiers: *Flood plain managment, San Diego County (Calif), Los Coches Creek (Calif).

A computer methodology for the preliminary costing of flood control facilities based on alternative land use patterns in a watershed is presented in this article. The computer program, called URB DRA CONS, enables rapid determination of flood flows and the costs of channel improvements required to accommodate these flows given different land use patterns and levels of flood protection. The planner can use the program to quickly test various urban patterns, to define flood plain limits, and to compare the cost of flood plain acquisition to channel improvement. The methodology consists of three basic programs: one to compare the outflow from sub-basin areas, one to relate flows of sub-areas and main channels to water-surface elevations or stage levels, and one to estimate the cost of channel improvements to achieve specified water elevations. The programs have been applied in a pilot study for the Los Coches Creek watershed in San Diego County. Several maps and tables from this application are included as well as appendices describing the program procedures in detail. The pilot study has renewed attention to flood plain planning in San Diego County. (Elfers-North Carolina)
W73-11254

THE ESTIMATION OF THE HYDROLOGICA IMPACT OF URBANIZATION: AN EXAMPLE OF THE USE OF DIGITAL SIMULATION IN HYDROLOGY,
University Coll., London (England).
G. E. Hollis.
February, 1970. 24 p, 9 fig, 3 tab, 35 ref.

Descriptors: *Urbanization, *Hydrologic models, *Computer simulation, Hydrology, Hydrologic data, Environmental effects, Watersheds, Runoff, Land use.
Identifiers: Canon's Brook, England.

Changing land uses due to urbanization have a significant effect on the hydrologic cycle of a watershed. This paper presents a study of the effect of urbanization in a small watershed in England, Canon's Brook. Since the data from the watershed was not ideal and conventional evaluation methods such as double mass, trend analysis, and multiple regression analysis have limitations, the study developed a computer simulation model to predict runoff flows. The simulation model incorporates such factors as interception, infiltration, and evapotranspiration. The inputs include daily values of precipitation, monthly values of sunshine, temperature, and wind speed. The output from the model is the predicted monthly runoff. Results have shown that while winter runoff has increased only slightly, summer and autumn runoff has increased five fold. Although the simulation model is able to overcome various data problems it also has some limitations and these are evaluated in relation to the results of the study. (Elfers-North Carolina)
W73-11259

THE EFFECT OF AFFORESTATION ON STREAMFLOW AT CATHEDRAL PEAK: REPORT NO. 1,
Forest Research Inst., Pretoria (South Africa).
U. W. Nanni.
Identifiers: Cathedral Peak Forest (So Afr), *Forestation effects, *Pinus-Patula-G, Runoff, *South Africa, Stream flow.

Streamflow from the first catchment which was afforested at the Cathedral Peak Forest Influences Research Station has decreased since afforestation. The decrease became evident when the Pinus patula trees, which were planted on 74% of the area, were 8 yr old. By the age of 17 yr, the annual decrease for the area afforested was 508 mm and appeared to have leveled off.--Copyright 1972, Biological Abstracts, Inc.
W73-11310

EFFECTS OF URBANIZATION ON FLOODS IN THE HOUSTON, TEXAS, METROPOLITAN AREA,
Geological Survey, Austin, Tex.
S. L. Johnson, and D. M. Sayre.
Available from NTIS, Springfield, Va 22151 as PB-220 751 Price $3.00 printed copy; $0.95 microfiche. Water-Resources Investigations Report 3-73, April 1973. 50 p, 7 fig, 9 tab, 15 ref.

Descriptors: *Urban hydrology, *Floods, *Urban runoff, *Runoff forecasting, *Rainfall-runoff relationships, Flood control, Gaging stations, Peak discharge, Urbanization, Environmental effects, Regression analysis, Indirect flood measurement, Correlation analysis, Hydrologic data.
Identifiers: *Houston (Texas), Urbanization runoff increase.

Runoff data from drainage basins in the Houston, Texas, metropolitan area and a 60-year rainfall record for the National Weather Service Station, Houston-City, were used to simulate 60 annual flood peaks at 26 sites. Selected frequency characteristics, based on these simulated annual peaks, are related to drainage area and percentage of impervious area. The relationships indicate that as urbanization increases the impervious surface from 1 to 35%, the magnitude of a 2-year peak is increased by a factor of 9, and the magnitude of a 50-year peak is increased by a factor of 5. Other analyses indicate that urbanization also significantly increases the magnitude of annual runoff. (Woodard-USGS)
W73-11402

ECOLOGICAL MONITORING OF TWO BEACH NOURISHMENT PROJECTS IN BROWARD COUNTY, FLORIDA,
Florida Atlantic Univ., Boca Raton. Dept. of Zoology.
For primary bibliographic entry see Field 02J.
W73-11528

CLIMATE CHANGE AND THE INFLUENCE OF MAN'S ACTIVITIES ON THE GLOBAL ENVIRONMENT,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 02A.
W73-11562

EFFECTS OF LOGGING ON PERIPHYTON IN COASTAL STREAMS OF OREGON,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11582

URBAN HYDROLOGY FOR THE PERIOD UP TO DECEMBER 1971.
National Water and Soil Conservation Organization, Wellington (New Zealand).

Hydrological Research Annual Report No 24, 1972. 21 p, 16 fig, 2 tab, 1 ref, 2 append.

Descriptors: *Urbanization, *Urban hydrology, *Storm runoff, *International Hydrologidal Decade, Projects, Hydrologic data, Data collections, Watershed management, Land use, Precipitation (Atmospheric), Streamflow, Flood frequency, Peak discharge, Foreign countries.
Identifiers: *New Zealand, *Manukau (New Zealand).

Under the auspices of the International Hydrological Decade the Ministry of Works is establishing a network of experimental basins to study the hydrogical characteristics of important soil and vegetation complexes of New Zealand. The study of the effect of cultural change on these characteristics is also included. This paper is on the Manukau City Experimental basin in which the hydrological effects of urbanization are studied. Included are reports of related studies in urban hydrology which are carried out near the experimental basin. Research is coordinated by the National Water and Soil Conservation Organization and is carried out in conjunction with other organizations. Ultimately it is hoped that experimental basins will be established in New Zealand. The study includes the influence of urbanization on flood peak dishcarges and flood volumes in particular and on the hydrological regime in general; data for developing and testing a mathematical model for the prediction of flood peak discharges for urban catchments under New Zealand conditions; data for refining existing urban stormwater drainage design techniques; and design data to assist in the solution of particular stormwater design problems within the catchments being studied. (Woodard-USGS)
W73-11698

EFFECTS OF ROADWAY AND POND CONSTRUCTION ON SEDIMENT YIELD NEAR HARRISBURG, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02J.
W73-11700

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

PLANT ANALYSIS FOR NUTRIENT ASSAY OF NATURAL WATERS,
Wisconsin Univ., Madison. Dept. of Botany; and Wisconsin Univ., Madison. Inst. of Plant Development.
For primary bibliographic entry see Field 05C.
W73-11057

FLUORESCENT PROBES IN THE DETECTION OF INSECTICIDES IN WATER,
Georgia Univ., Athens. Dept. of Entomology.
C. M. Himel.
Copy available from GPO Sup Doc as EP1.23/2:73-217, $0.75; microfiche from NTIS as PB-221 336, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-217, April 1973. EPA Project 16020 EAO.

Descriptors: *Fluorescence, *Insecticides, Water pollution, *Pollutant identification, Analytical techniques, Methodology, *Enzymes.
Identifiers: *Fluorescent probes, Cholinerterase enzymes.

Objectives included synthesis of candidate fluorescent probe molecules for cholinesterase enzymes and evaluation of the feasibility of developing a new analytical method for insecticides in water. This was accomplished. Results with Dursban, Thioden and certain other insecticides are in the range of 1X10-7M. Insecticides which do not

compete with, or displace the probe from its complex are not detected. Experimental parameters for design and synthesis of optimum probe molecules were developed. (EPA)
W73-11061

NEUTRON ACTIVATION ANALYSIS OF BOTTOM SEDIMENTS,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
R. V. Moore, and O. W. Propheter.
Copy available from GPO Sup Doc as EP1.23/2:73-009, $0.40; microfiche from NTIS as PB-221 339, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-009, March 1973. 16 p, 2 tab, 7 ref. EPA Project 16020 GHQ.

Descriptors: *Trace elements, *Bottom sediments, *Neutron activation analysis, Analytical techniques, Pollutant identification, Water pollution.
Identifiers: Ge (Li) detector.

Instrumental neutron activation analysis (INAA) was applied to bottom sediments obtained from 17 locations (small and large rivers, a canal, coastal waters, and a bay) within the United States to determine the applicability of INAA to water pollution studies. Irradiations of 30 seconds and 60 minutes, followed by three pulse-height analyses of gamma radiation, detected and measured up to 43 elements including most elements of interest. Decay times did not exceed seven days. Sample handling was minimal. Elements readily analyzed are Al, As, Ba, Mg, Dy, Mn, V, Cr, Co, Fe, La, Sb, Br, Cl, Au, K, Sm, Se, Na, Th, and Ti. (EPA)
W73-11067

EFFECTS OF CHEMICAL VARIATIONS IN AQUATIC ENVIRONMENTS: VOLUME III, LEAD TOXICITY TO RAINBOW TROUT AND TESTING APPLICATION FACTOR CONCEPT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 05C.
W73-11076

WATER RESOURCES DATA FOR ALABAMA, 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, University, Ala.
For primary bibliographic entry see Field 02K.
W73-11085

SURVEY OF APPLICATION OF RADIATION TO PREPARATIVE CHEMISTRY,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 02K.
W73-11119

X-RAY PHOTOELECTRON SPECTROSCOPY OF METALS IN AMINO ACID COMPLEXES AND PROTEINS, (RONTGEN-PHOTOELEKTRONEN-SPEKTROSKOPIE VON METALLEN IN AMINOSAUREKOMPLEXEN UND PROTEINEN),
Tuebingen Univ. (West Germany). Chemisches Institut.
G. Jung, and M. Ottnad.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 282-285, March 6, 1973. 2 tab, 21 ref.

Descriptors: *Amino acids, *Proteins, *X-ray spectroscopy, *Pollutant identification, Metals, Ions, Copper, Cobalt, Sulfur compounds, Chemical analysis, Chemical reactions.
Identifiers: *X-ray photoelectron spectroscopy, *Metal complexes, Organometallics, Photoelectron spectra.

X-ray photoelectron spectroscopy gives information about the oxidation states and the ligands of metal ions in metalloproteins. To interpret the spectra of the metalloenzymes the photoelectron spectra of amino acid complexes were recorded. Drastic differences were noted for the binding energies of Cu and Co in the complexes and in the proteins. This is probably due to metal-metal interactions in the investigated erythrocupreins. Sulphur-containing compounds are very suitable for X-ray photoelectron spectroscopic measurements. It could be shown that sulphur is not involved in the binding of the metal ions. (Holoman-Battelle)
W73-11121

ANION EXCHANGE SEPARATIONS OF THE ELEMENTS EXTRACTABLE WITH TRIBUTYL PHOSPHATE. IV, (ANIONENAUSTAUSCHTRENNUNGEN DER MIT TRIBUTYLPHOSPHAT EXTRAHIERBAREN ELEMENTE. IV),
Vienna Univ. (Austria). Analytisches Institut.
W. Koch, and J. Korkisch.
Mikrochimica Acts, Vol 2, p 225-244, March 1973. 5 fig, 3 tab, 10 ref.

Descriptors: *Separation techniques, *Solvent extractions, *Anion exchange, Methodology, Spectrophotometry, Chemical analysis, Lead, Manganese, Molybdenum, Adsorption, Cations, Pollutant identification, Heavy metals.
Identifiers: *Ion exchange resins, Dowex 1 X8, Tributyl phosphate, Mixtures, *Organic solvents, Indium, Thallium, Thorium, Zirconium, Arsenic, Tin, Vanadium, Antimony, Bismuth, Uranium, Selenium, Tellurium, Rare earth elements.

Methods are described for the separation of elements that can be extracted with TBP with the employment of the strongly basic anion exchanger Dowex 1, X8 in its chloride form and an aqueous-organic mixture of 30 vol. percent TBP, 60 vol. percent methylglycol, and 10 vol. percent of 12 M hydrochloric acid. In particular, separations of uranium were studied from elements that are extracted well by TBP from hydrochloric acid solutions and from those that are only poorly extracted by TBP. The differing adsorption behaviors may be explained through the resulting KIALE-effect. The behavior of the elements in the mixture containing TBP was compared with that in pure aqueous-hydrochloric acid mixtures and the difference was explained through the above effect. Separation-procedures are given for uranium from In (III), Tl (III), Th (IV), Pb (II), Mn (II), Zr (IV), As (III,V), Sn (II, IV), Mo (VI), V (IV,V) and Sb (V). In the separation from bismuth it was possible to establish the existence of a competition of the two differing strongly adsorbed elements for the functional groups of the resin, which leads to the fact that only a part of the uranium is adsorbed. Similarly there was found a reciprocal action between uranium and manganese, whose consequence was that the manganese is preferentially eluted. In addition, a procedure is described for the separation of the elements selenium and tellurium and also for various spectrophotometric methods for the quantitative determination of the studied metal ions in mixtures containing TBP. (Holoman-Battelle)
W73-11122

DETERMINATION OF MERCURY CONTENTS IN DIVERSE SAMPLES OF FISH AND OTHER BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS, (NEUTRONENAKTIVIERUNGSANALYTISCHE BESTIMMUNGEN VON QUECKSILBERGEHALTEN IN DIVERSEN FISCHPROBEN UND A NDEREN BIOLOGISCHEN MATERIALIEN),
Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Radiochemie.
H. Ruf, and H. Rohde.
Zeitschrift fur Analytische Chemie, Vol 263, No 2, p 116-120, January 26, 1973. 4 fig, 5 tab, 7 ref.

Descriptors: *Mercury, *Fish, *Neutron activation analysis, *Foods, Separation techniques.
Identifiers: *Biological samples, *Sample preparation, Tuna, Whitefish.

Mercury contents in diverse samples of fish and other biological materials have been determined by neutron activation analysis measuring the activity of Hg-197. A method described in the literature was used for the indispensable separation of the mercury activity utilizing the volatility of $HgCl_2$ and the low electric potential of deposition of mercury metal. The separation of Au-198 usually found in the irradiated materials was accomplished by volatilisation of the mercury metal at 850 C. Seriously high contents of mercury were found in some samples of Japanese canned tuna and in whitefish of the Rhine River. (Little-Battelle)
W73-11123

CLEAN-UP OF CRUDE EXTRACTS CONTAINING PESTICIDE RESIDUES BY AN ATOMATIC APPARATUS BASING UPON THE PRINCIPLE OF 'SWEEP CO-DISTILLATION, (REINIGUNG PESTICIDRUCKSTANDE ENTHALTENDER ROHEXTRAKTE MIT EINER AUTOMATISCH ARBEITENDEN APPARATUR NACH DEM PRINZIP DER KOMBINIERTEN SPULUND CODESTILLATION (SWEEP CODISTILLATION),
Biological Federation for Soil and Forestry, Berlin (West Germany).
J. Pflugmacher, and W. Ebing.
Zeitschrift fur Analytische Chemie, Vol 263, No 2, p 120-127, January 26, 1973. 2 fig, 1 tab, 20 ref.

Descriptors: *Pesticide residues, *Automatic control, *Laboratory equipment, Research equipment, *Gas chromatography, Instrumentation, *Insecticides, *Organophosphorus pesticides, Methodology, Chemical analysis, Automation, Phosphothioate pesticides, Diazinon.
Identifiers: Sweep co-distillation, Cleanup, Chemical recovery, Ethyl azinphos, Bromophos, Ethyl bromophos, Chlorfenvinphos, Chlorthion, Demeton-S, Dibrom, Dichlofenthion, Dichlorvos, Dimethoate, Disulfoton, Disulfotonsulfon, Ethion, Fenchlorphos, Fenitrothion, Fensulfothion, Fenthion, Malathion, Mevinphos, Parathion, Methyl parathion, Paraoxon, Phenkapton, Phorate, Thiometon, Thionazin.

An automatic apparatus has been constructed which cleans up crude extracts based upon the principle of 'sweep co-distillation' for gas-chromatographic residue analysis of insecticides. With this instrumentation, e.g. crude extracts from 13 crops containing 27 phosphorus pesticides have been cleaned up using unique conditions. Average recovery values reach from 66.4 to 112.4 percent. Concentration levels of the residues had been elected in accordance with the German tolerance list. The apparatus is suitable for further applications. (Holoman-Battelle)
W73-11124

APPLICATION OF RADIOCHEMICAL METHODS IN ENVIRONMENTAL RESEARCH, (ANWENDUNG RADIOCHEMISCHER METHODEN IN DER UMWELTFORSCHUNG),
Technische Hochschule, Darmstadt (West Germany). Eduard-Zintl-Institut.
K. H. Lieser.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 304-307, March 6, 1973. 3 tab.

Descriptors: *Radiochemical analysis, *Methodology, *Indicators, *Chemical analysis, Carbon radioisotopes, Radioactivity, Heavy metals, Alkali metals, Alkaline earth metals, Halogens, Gold, Manganese, Sodium, Bromine, Cesium, Phosphorus, Chlorine, Potassium, Chromium, Copper, Zinc, Cadmium, Mercury, Nickel, Strontium, Molybdenum, Tin, Sulfur, Calcium, Iron.

Identifiers: Environmental research, *Dilution analysis, Sensitivity, Environmental samples, C-14, Rare earth elements, Indium, Europium, Dysprosium, Silver, Samarium, Holmium, Rhenium, Iridium, Gallium, Arsenic, Palladium, Antimony, Scandium, Lanthanum, Praseodymium, Thulium, Ytterbium, Tungsten, Osmium, Germanium, Selenium, Rubidium, Yttrium, Ruthenium, Barium, Neodymium, Gadolinium, Activation analysis, Dilution analysis, Tellurium, Terbium, Erbium, Cerium, Tantalum, Platinum, Hafnium, Thallium, Bismuth, Zirconium.

Activation analysis, dilution analysis and indicator methods (C-14, T) are discussed in general. The high sensitivity of radiochemical methods is emphasized. (Holoman-Battelle)
W73-11125

APPLICATION OF THE FLUORESCENT ANTIBODY TECHNIQUE TO THE DIFFERENTIATION OF ASPERGILLUS SPECIES, CANDIDA SPECIES AND ZYGOMYCETES IN PARAFFIN SECTION OF FORMALIN-FIXED TISSUES,
North Carolina Univ., Chapel Hill.
E. R. Williams.
Available from Univ., Microfilms, 300 No Zeeb Rd., Ann Arbor, Michigan 48106 Order No 73-4899. Ph D Dissertation, 1972. 129 p.

Descriptors: *Pathogenic fungi, *Pollutant identification, *Human diseases, Methodology, Reliability, Fluorescence, Animal diseases.
Identifiers: *Fluorescent antibody techniques, Reagents, *Candida spp, *Aspergillus spp, *Zygomycetes, Antisera, Animal tissues, Staining, Candidiasis, Aspergillosis, Histology, Sample preparation, Serotypes, Rhizopus species, Absidia corymbifera, Mucor pusillus, Light microscopy, Sensitivity, Chemical digestion, Sample preservation.

It is possible to differentiate the Candida spp., Aspergillus spp. and zygomycetes in paraffin sections of formalin-fixed tissues through the use of fluorescent antibody (FA) procedures with 2 diagnostic reagents. Hyperimmune antisera were produced against C. albicans serotype A, C. albicans serotype B, C. krusei, C. parapsilosis, C. tropicalis, C. pseudotropicalis, A. flavus group (A. oryzae), A. fumigatus, Rhizopus arrhizus, R. oryzae, Absidia corymbifera, and Mucor pusillus. Antisera demonstrating indirect fluorescent antibody (IFA) titers of 1:8 or higher and their corresponding preimmunization sera were labeled with fluorescein isothiocyanate. Subsequent testing of the labeled antiglobulins and their corresponding preimmunization globulins on cultures of homologous and heterologous fungi demonstrated that 8 of the 13 reagents prepared were unsuitable for further evaluation. A mixed screening reagent for the diagnosis of candidiasis and aspergillosis was prepared by using a mixture of labeled A. fumigatus and C. pseudotropicalis adsorbed with R. arrhizus and A. ramosa. A second reagent for the identification of candidiasis was prepared by mixing labeled C. albicans serotype A and C. krusei. A third confirmatory reagent for the identification of zygomycosis was prepared against R. arrhizus antiglobulins. This latter reagent will identify all of the medically important zygomycetes with the exception of M. pusillus. An extended list of medically important fungi, those other than the Candida spp., Aspergillus spp. and the zygomycetes, was used to test these 3 diagnostic reagents for cross-reactivity. Evaluations of the mixed Candida reagent, the mixed Aspergillus reagent, and the zygomycete reagent in tissue sections showed good sensitivity and specificity for their respective diseases. Blind studies using tissue sections showed that these reagents provided a rapid, reliable and reproducible procedure for the detection and identification of these fungi in tissue. Trypsin digestion of tissue sections prior to FA staining was evaluated and found to enhance greatly the staining results in most of the tissues tested. In no case did digestion reduce fluorescence, or affect sensitivity or specificity. The feasibility of counterstaining by FA fungi in tissue sections previously stained with conventional histological stains was evaluated. (Holoman-Battelle)
W73-11126

VOLUMETRIC DETERMINATION OF NICKEL BY HIGH FREQUENCY IMPEDIMETRY,
Consejo Superior de Investigaciones Cientificas, Santiago (Spain). Departamento de Quimica Analitica.
S. Bara-Temes, F. Bermejo-Martinez, and A. Prieto-Bouza.
Microchemical Journal, Vol 17, No 6, p 625-631, December 1972. 3 tab, 2 ref.

Descriptors: *Nickel, *Volumetric analysis, *Aqueous solutions, Chemical analysis, Heavy metals, Methodology, Separation techniques, Iron, Aluminum.
Identifiers: *High frequency impedimetry, Chemical interference, Accuracy, Alkaline media, Sodium bicarbonate.

A method is proposed for the determination of nickel by high frequency impedimetry in the presence of aluminum, iron, calcium, and mercury by the use of TTHA in NaHCO3 medium. A sample volume containing not more than 6 mg of nickel is placed in the titration cell to which is added 1 ml of one percent sodium bicarbonate solution. The mixture is then removed for 2 min to allow precipitation and then diluted with deionized water to 80 ml. Titration is carried out with 0.01 M disodium salt of TTHA solution. The method is accurate in the presence of not more than 0.0004 mole of noninterfering substances. (Holoman-Battelle)
W73-11127

ALPHA-AL203 AS AN ADSORBENT IN THIN--LAYER CHROMATOGRAPHY,
Silesian Univ., Katowice (Poland). Inst. of Chemistry.
B. Korczak, J. Wegrzynek, H. Habla, and J. Sliwiok.
Microchemical Journal, Vol 17, No 6, p 632-637, December 1972. 5 fig, 2 tab, 4 ref.

Descriptors: *Separation techniques, Methodology, *Organic compounds, Pollutant identification, Chemical analysis.
Identifiers: *Adsorbents, *Thin layer chromatography, Alpha-Aluminum oxide, Alumina, Butter yellow, Sudan G, Indophenol, Organic dyes.

The utility of laboratory-made alpha-Al203 as an adsorbent in the thin layer chromatographic separation of selected organic compounds was determined by the separation of a mixture of test-dyes (butter yellow, Sudan G and indophenol) and calculation of the following coefficients: R sub f, Lpt, I sub g and t. The comparison was made conducting the same experiments with Al203 produced by Woelem. Aluminum oxide was prepared by sieving aluminum hydroxide (USSR) to unify granule diameter and roasting at 1250C for 5 hr. It was shown to have several advantages common to proper adsorbents for TLC purposes. (Holoman-Battelle)
W73-11128

STUDY OF THE CHANGES IN THE STRUCTURE OF TWO ALGAL POPULATIONS: AN R--TYPE FACTOR ANALYSIS,
Louvain Univ. (Belgium). Institut Carnoy.
F. Symons.
Hydrobiologia, Vol 41, No 1, p 107-112, Feb 28, 1973. 3 tab, 4 ref.

Descriptors: *Diatoms, *Chlorophyta, *Plant populations, *Biological communities, Statistical methods, Ponds, Correlation analysis, Scenedesmus, Chrysophyta.
Identifiers: *Species diversity, Synedra species, Navicula species, Amphora ovalis var. pediculus, Cymbella affinis, Nitszchia species, Surirella robusta var. splendida, Pediastrum species, Scenedesmus species.

Two algal populations of the same pond were studied over a period of 8 months. For each of those populations an r-type factor analysis has been executed. Three independent species structures were proposed for each of the populations. Characteristic differences between the two populations are discussed under the assumption that one of them should be more self-regulating than the other one. A possible interaction between the development of diatoms and green algae is put forward as a perspective for further research. (Little-Battelle)
W73-11129

PARTITIONING OF A BRACKISH WATER HABITAT BY COPEPOD SPECIES,
Ghent (Belgium). Dept. of Zoology Rijksuniversiteit.
C. Heip.
Hydrobiologia, Vol 41, No 2, p 189-198, March 29, 1973. 1 fig, 5 tab, 8 ref.

Descriptors: *Dominant organisms, *Brackish water, *Copepods, *Succession, *Niches, Benthos, Sediments, Sampling, Reproduction, Periphyton, Zooplankton, Distribution patterns, Biological communities, Balance of nature.
Identifiers: *Sample preparation, Macroinvertebrates, *Belgium (Dievengal), Halicyclops magniceps, Diacyclops bisetosus, Megacyclops viridis, Canuella perplexa, Tachidius discipes, Amphiascoides debilis, Schizopera compacta, Nitocra typica, Nitocra spinipes, Mesochra lilljeborgi, Paronychocamptus nanus.

A shallow brackish water pond in Belgium was sampled for copepods to study how species attain separation of niches. Samples were taken fortnightly by pushing glass rods 5 cm into the sediment and withdrawing the sample containing the sediment and the water column. Temperatures were also regularly recorded. Samples were fixed with 70 percent alcohol, washed in a trough, and the material washed away was caught in a sieve with 50 mu mesh. Animals were extracted from detritus under a microscope and counted. Copepods were identified to species and females carrying eggs were noted. Eleven species were identified: Halicyclops magniceps, Diacyclops bistetosus, Megacyclops virilis, Canuella perplexa, Tachidius discipes, Amphiascoides debilis, Schizopera compacta, Nitocra typica, Nitocra spinipes, Mesochra lilljeborgi, and Paronychocamptus nanus. The successful species show a separation in time with regard to the date of maximum occurrence and the date of maximum reproductive activity. The succession of the five species examined is: Mesochra lilljeborgi, Paronychocamptus nanus, Tachidius discipes, Halicyclops magniceps and Canuella perplexa. Moreover, these species and others show a separation in space: C. perplexa is an endopsammic, Paronychocamptus nanus a mesopsammic, and Tachidius discipes an epepsammic species. Three cyclopoid species are planktonic. Two other species (Nitocra typica and Mesochra lilljeborgi) are more numerous in the periphyton than in the benthos. (Little-Battelle)
W73-11130

ENUMERATION AND DIFFERENTIATION OF WATER BACTERIA WITH PHOSPHORUS-32,
Roorkee Univ. (India).
P. Khanna.
Journal Water Pollution Control Federation, Vol 45, No 2, p 262-268, February 1973. 4 fig, 4 tab, 11 ref.

Descriptors: *E. coli, *Radioactivity techniques, Absorption, *Phosphorus, Pollutant identification, Separation techniques, Coliforms, Enteric bacteria, Streptococcus, Water analysis.

Identifiers: Co-precipitation, *Streptococcus faecalis, *Aerobacter aerogenes, *Proteus vulgaris, P-32.

A co-precipitation method for enumerating bacteria in water samples is based on the fact that non-multiplying cells utilize phosphorus by rapidly turning over ribonucleic acid and phosphoproteins. Since these compounds are insoluble in cold trichloroacetic acid (TCA), they can be precipitated out and measured so that the incorporation of radioactive phosphorus can be followed. The method was tested by mixing buffered E. coli, P-32, and carrier phosphorus and incubating for various time periods. After incubation, a clear solution of eggwhite equilibrated with carrier phosphorus was added, the mixture stirred, and cold TCA added to cause precipitation. The precipitate was then centrifuged, washed in TCA, ethanol, ethanol-ether, and ether, suspended in acetone, and filtered through a Whatman No. 4 disk. The P-32 activity was read from the filters with a Geiger-Mueller counter as an estimate of the bacterial population. The method, which provided results in 4 hrs., showed a linear relationship between population and phosphorus uptake in exposures up to 14 hrs. Tests with E. coli, Streptococcus faecalis, Aerobacter aerogenes, and Proteus vulgaris showed that gram-positive and negative cells can be differentiated by appending 1 percent KOH and 2 percent bile salt, respectively, to test samples. (Little-Battelle)
W73-11133

ISOLATION OF SALMONELLAE FROM MODERATELY POLLUTED WATERS,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
B. J. Dutka, and J. B. Bell.
Journal Water Pollution Control Federation, Vol 45, No 2, p 316-324, February 1973. 2 fig, 4 tab, 23 ref.

Descriptors: *Water sampling, *Isolation, *Water pollution, *Salmonella, Methodology, *Pollutant identification, On-site tests, Laboratory tests, On-site investigations, Enteric bacteria, Coliforms, Pathogenic bacteria, Filtration, St. Lawrence River, Aerobic bacteria.
Identifiers: *Selective media, Culture media, Enrichment, Culturing techniques, Biochemical tests, Serotypes, Fecal coliforms, Fecal pollution, Fecal streptococci, Plate counts, Membrane filters, Species density, Tetrathionate broth, Selenite broth, Brilliant green agar, Antisera, Bay of Quinte, Most probable number test, Salmonella species.

Qualitative sampling techniques and enrichment broth/selective agar combinations for the demonstration of Salmonella in receiving waters were compared. The sampling procedures used were: (1) placement of collecting pad (s) at a specific station; (2) collection of a 5-gal (18.9-1) grab sample; (3) field filtration of 50 gal (189 1) of water in 5-gal (18.9-1) units; (4) collection of approximately 400 ml of water for coliform, fecal coliform, and fecal streptococcus density determinations and for 20 and 35 C standard plate count tests. One to eight days later the collecting pads were retrieved, and Procedures 2, 3, and 4 were repeated. All water samples, collecting pads, and filters were put on test within 6 hr of collection. Strips of the collecting pad (s), and the various filters were aseptically placed in both prewarmed tetrathionate and selenite enrichment broths. After incubation at 41.5 C for 20 plus or minus 2 hr, colonies resembling salmoneliae were screened using phenylalanine and Mac Conkey's agars and incubated overnight at 35 C. Cultures showing reactions typical of Salmonella with these media were slide tested with Salmonella polyvalent O antisera. Specific O and H antisera were used to identify fully all suspected salmonellae. The collecting pad and 50-gal (189-1), field-filtered samples were equally efficient in isolating Salmonella from waters containing low to moderate numbers of coliforms. The efficiency of the collecting pads did not increase with prolonged exposure (3 to 5 days). The use of the 50-gal (189-1) on-site filtering technique is recommended for routine stream surveys. Tetrathionate broth/brilliant green agar proved to be the most productive broth-agar combination, but in different geographical locations, other media combinations may prove to be more productive. (Holoman-Battelle)
W73-11134

OCCURRENCE OF SALMONELLA IN OXIDATION DITCHES,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Zoonoses.
E. H. Kampelmacher, and L. M. van Noorle Jansen.
Journal Water Pollution Control Federation, Vol 45, No 2, p 348-352, February 1973. 5 tab, 4 ref.

Descriptors: *Oxidation lagoons, *Salmonella, *Pollutant identification, *Waste water (Pollution), *Waste water treatment, Effluents, Sampling, Efficiencies, Industrial wastes, Methodology, Aerobic bacteria, Enteric bacteria, Isolation, Diseases.
Identifiers: *Slaughterhouse wastes, Tetrathionate broth, Enrichment, Most probable number test, Influents, Salmonella infantis, Salmonella binza, Salmonella typhimurium var. copenhagen, Salmonella tennessee, Salmonella derby, Salmonella bredeney, Salmonella brandenburg, Salmonella give, Salmonella livingstone, Salmonella panama, Salmonella typhimurium, Salmonella manchester, Salmonella stanley, Salmonella thompson.

An investigation was undertaken to determine the capability of oxidation ditches of the type used in small municipalities for the treatment of waste water. Two oxidation ditches that treat slaughterhouse wastes were studied in reference to their ability to remove Salmonella. Five 100 ml samples of circuit liquid, influent, and effluent were collected within 30 min, transferred together to a liter bottle, and thoroughly shaken. The mixed samples were tested for salmonellae within a 4-hr period using tetrathionate enrichment media prepared by the Muller-Kauffman method, and the most probable number (MPN) computed. Variable numbers of Salmonella species were present in the effluent of the plants studied. The number of salmonellae/100 ml was less than 20, with one exception (350/100 ml). The ability of the plants to remove Salmonella was comparable to that of conventional waste water treatment plants. Exact measurements of Salmonella reduction in the plant effluents were not possible, but it was feasible to determine bacteria counts in the influent, circuit liquid, and effluent during specific periods. In one of the plants, Salmonella contamination could be traced to its source. Results support a theory about the circulation of Salmonella bacteria in natural systems. (Holoman-Battelle)
W73-11136

REMOTE SENSING TECHNIQUES FOR DETECTING OIL SLICKS,
National Aeronautics and Space Administration, Washington, D.C.
C. E. Catoe.
Journal of Petroleum Technology, Vol 25, p 267-278, March 1973. 12 fig, 2 tab, 13 ref.

Descriptors: *Oil spills, *Remote sensing, *Pollutant identification, *Optical properties, *Fluorescence, *Reflectance, Methodology, Physical properties, Water pollution, Sea water, Radar, Infrared radiation, Oil pollution, Mapping, Ultraviolet radiation.
Identifiers: Oil films, Oil types, Panchromatic photography, Infrared photography, Multispectral photography, Ultraviolet imagery, Color photography, Infrared color photography, Infrared imagery, Passive microwave imagery, Infrared radiometry, Infrared spectral radiometry, Passive radiometry, Fraunhofer line discriminator, Barringer correlation spectrometer, Wide-range image, Spectrophotometer, Multispectral optical-mechanical scanner imagery.

Those signature properties of oil slicks that make them amenable to remote sensing are described with emphasis on those signature properties that are useful in (1) detecting oil films on water surfaces, (2) mapping the areal extent of the slicks, (3) measuring the thickness of the slicks, and (4) identifying oil types. The reflective and fluorescent signatures are correlated with detection in the ultraviolet, visible, infrared, microwave, and radar regions. Remote sensing techniques are considered in two broad categories: imaging techniques (spatial dimension), and nonimaging techniques (spectral dimension). The imaging techniques are panchromatic photography, infrared photography, multispectral photography, ultraviolet imagery, infrared imagery as well as multispectral, optical-mechanical scanner imagery, color photography, infrared color photography, radar, and passive microwave imagery. Nonimaging techniques include infrared radiometry, infrared spectral radiometry, passive radiometry, Fraunhofer line discriminator, Barringer, correlation spectrometer, and wide-range image spectrophotometer. (Holoman-Battelle)
W73-11137

A CONTINUOUS-FLOW APPARATUS FOR ASSESSING THE TOXICITY OF SUBSTANCES TO MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, (England). Fisheries Lab.
For primary bibliographic entry see Field 05C.
W73-11169

FALLOUT OF SODIUM SULPHATE NEAR A KRAFT MILL,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Physics.
L. Hastings, R. Freitrag, and A. Smith.
Atmos Environ. Vol 6, No 4, p 241-246, 1972. Illus.
Identifiers: *Fallout (Kraft Mill), Snow, *Sodium sulfate, *Air pollution.

The rate of fallout of SO42- in the form of Na2SO4 in the vicinity of a kraft mill was determined by taking samples of accumulated snow. The distribution of fallout as a function of distance from the mill was determined.--Copyright 1972, Biological Abstracts, Inc.
W73-11175

PRECISION AND DETECTION LIMITS OF CADMIUM, MANGANESE, COBALT, AND NICKEL IN SULFIDES BY ELECTRON MICROPROBE ANALYSIS,
Geological Survey, Denver, Colo.
R. H. Heidel.
Analytical Chemistry, Vol 44, No 11, p 1860-1862, September 1972. 3 tab, 8 ref.

Descriptors: *Analytical techniques, *Instrumentation, *Evaluation, *Metals, Chemistry, Chemical properties, Mineralogy, Laboratory tests, Electrochemistry, Measurement, Cobalt, Nickel, Cadmium, Manganese, Sulfides, Silicates.
Identifiers: *Electron microprobe analysis.

The electron microprobe is discussed as a means of analyzing very small amounts of metal and of finding the levels of concentration of metals in sulfides. It offers the unique advantage of analyzing mixtures of minerals rapidly and accurately where conventional chemical methods are not possible or feasible. Although the detectability limits for the electron microprobe are poor when considered in terms of the minimum amount of an element detected relative to the total sample in a homogeneous mixture, the ultimate sensitivity is very high considering the number of atoms required to

produce a signal detectable above the background. Sensitivities, precision and minimum detectability limits were obtained and presented for cobalt, nickel, manganese, and cadmium. The limits are basically higher in sulfides than for these elements in silicates. Improvement in counting precision and correspondingly better analytical results are possible with longer counting periods. (Jerome - Vanderbilt)
W73-11178

APPLICATION OF REGRESSION ANALYSIS TO THE STUDY OF BACKGROUND VARIATIONS IN TRACE METAL CONTENT OF STREAM SEDIMENTS,
British Columbia Univ., Vancouver. Dept. of Geology.
J. Chatupa, and K. Fletcher.
Economic Geology, Vol 67, No 7, p 978-980, November 1972. 4 ref.

Descriptors: *Metals, *Streambeds, *On-site investigations, *Regression analysis, Streams, Sediments, Trace elements, Copper, Zinc, Iron, Manganese, Nickel, Sampling, Mathematical studies.
Identifiers: *Background level.

Forty stream sediment samples were analyzed for copper, zinc, iron, manganese and nickel. The results demonstrate the extent to which background fluctuations in trace element content of sediments can be accounted for by a few readily determined parameters such as iron content, <270 mesh material, ignition loss, and stream sample pH. Having established the regression equation for a trace element, a theoretical value for its content in a particular sample and the difference, or residual, between this value and the reported content can be found. Large positive residuals indicate additional sources of metal unaccounted for by the independent variables. (Oleszkiewicz -Vanderbilt)
W73-11179

COMPOSITION OF AIRBORNE LEAD PARTICLES,
Ethyl Corp. Research Labs., Ferndale, Mich.
G. L. Ter Haar, and M. A. Bayard.
Nature, Vol 232, No 5312, p 553-554, August 20, 1971. 5 ref.

Descriptors: *Air pollution, *Heavy metals, *Lead, *Public health, Chemistry, Pollutant identification, Effluents, Halogens, Casoline, X-ray diffraction.
Identifiers: Lead compounds.

Air samples were collected from a rural area, a busy highway, and about 400 yards from that highway in an investigation of airborne lead particles and the role of automobile exhaust in their formation. The air samples were analyzed for 14 different lead compounds. The samples taken near the highway and 400 yards from the highway contained about 2.6% and 1.2% lead respectively, while the rural sample contained only a few tenths of a percent lead. Samples of automobile exhaust were also taken and passed into a 4,000 cubic foot black plastic bag containing clean dry air. The air bag data showed that lead bromide and chlorine compounds will break down and form lead carbonates, oxycarbonate and oxides within 18 hours without sunlight. These results make it unnecessary to postulate photolysis of lead compounds to account for loss of halogen. It is suggested that lead oxide, lead carbonate, basic lead carbonate or a mixture of these would be a good choice for experimental studies of the health effects of lead in the atmosphere. (Jerome - Vanderbilt)
W73-11188

WATER SAMPLING GUIDELINES AND INTERPRETATION OF DATA,
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 07A.
W73-11205

LIQUID SAMPLING,
Pro-Tech, Inc., Malvern, Pa. (assignee).
For primary bibliographic entry see Field 07B.
W73-11235

WASTE WATER SAMPLER,
Tri-Aid Sciences, Inc., Rochester, N.Y. (assignee).
L. G. Lynn, and D. A. Quadrini.
U. S. Patent No 3,719,081, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 45, March 6, 1973.

Descriptors: *Patents, *Waste water, *Sampling, Equipment, *Pollution abatement, *Water pollution control, *Water quality control.

This apparatus is intended for automatically and periodically collecting samples from a stream of waste water for pollution control purposes. At a control point a signal is applied to an integrator which produces an output voltage proportionate to the quantity of effluent that has passed the probe in a preceding interval. Each time the voltage reaches a predetermined value, a threshold circuit resets the integrator and pulses a first register to record the quantity of effluent for a given period, and simultaneously pulses a presettable counter. This produces a sampler enabling signal every time the counter reaches zero and resets. This enabling signal momentarily energizes a solenoid in a remote sampler to cause it to pump a sample of waste water from the flume to a sample receptacle. (Sinha-OEIS)
W73-11243

AREAWIDE TRACE METAL CONCENTRATIONS MEASURED BY MULTIELEMENT NEUTRON ACTIVATION ANALYSIS - A ONE DAY STUDY IN NORTHWEST INDIANA,
Michigan State Univ., East Lansing. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 05B.
W73-11278

ARSENIC, CADMIUM, COPPER, MERCURY, AND ZINC IN SOME SPECIES OF NORTH ATLANTIC FINFISH,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W73-11279

HEAVY METALS: FALLOUT AROUND A POWER PLANT,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein, and P. Russell.
Environmental Science and Technology, Vol 7, No 4, p 357-358, April 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Soil pollution, *Heavy metals, *Fallout, *Coals, *Sampling, Testing, Electric power production, *Air pollution, Lead, Cadmium, Cobalt, Chromium, Copper, Iron, Mercury, Nitrogen, Titanium, Zinc, Atmosphere, Fossil fuels, Analytical techniques, Measurements.

Research is reported on the problem of land area which would be burdened by fallout from a major coal burning facility. The area surrounding a 650 Mw electric generating plant on the eastern shore of Lake Michigan was chosen for the study. Samples of soil and Lake Michigan sediments were taken from 45 sites and were analyzed for metal content. Soils around the plant were found to be enriched in Ag, Cd, Co, Cr, Cu, Fe, Hg, Ni, Ti, and Zn. This enrichment corresponded to wind patterns and with the metal content of the coal except for Hg, which was only slightly enriched. Plant materials were enriched in Cd, Fe, Ni, and Zn. (Jerome - Vanderbilt)
W73-11282

WATER ANALYSIS,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02K.
W73-11285

SEA FISH CONTAMINATION WITH MERCURY (CONTAMINATION DES POISSONS DE MER PAR LE MERCURE),
For primary bibliographic entry see Field 05C.
W73-11289

THE USE OF ATOMIC ABSORPTION FOR ANALYSIS OF NATURAL WATERS,
Geological Survey, Denver, Colo.
M. J. Fishman.
Atomic Absorption Newsletter, Vol 5, No 5, p 102-106, September-October 1966. 7 fig, 10 tab, 1 ref.

Descriptors: *Metals, *Surface waters, *Absorption, *Analytical techniques, Instrumentation, Analysis, Sodium, Zinc, Copper, Potassium, Manganese, Calcium, Strontium, Laboratory tests, Water quality, Water pollution, Indicators, Trace elements.
Identifiers: *Atomic absorption spectroscopy, Lithium, Sensitivity.

Atomic absorption methods have been applied to the determination of sodium, potassium, lithium, strontium, calcium, magnesium, copper, manganese, and zinc in natural waters. The interference effects most likely to occur from other substances normally found in water were investigated, and means of eliminating interferences are discussed. Detection limits for many of the elements are as low as or lower than those obtained by other methods. Recovery in tests, replicate analyses, and comparison of results with those obtained by other methods show that atomic absorption methods are accurate and reproducible, and provide a more rapid means for the determination of these elements in water. (Oleszkiewicz-Vanderbilt)
W73-11291

DISTRIBUTION OF DISSOLVED MERCURY IN THE IRISH SEA,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-11293

ATOMIC ABSORPTION SPECTROPHOTOMETRY AS A TOOL FOR THE WATER CHEMIST,
Calgon Corp., Pittsburgh, Pa.
J. A. Platte, and V. M. Marcy.
Atomic Absorption Newsletter, Vol 4, No 6, p 289-292, June 1965. 3 fig, 5 tab, 4 ref.

Descriptors: *Instrumentation, *Water analysis, *Metals, Analytical techniques, Iron, Copper, Magnesium, Calcium, Zinc, Nickel, Separation techniques, Laboratory tests, Absorption, Water quality, Trace elements, Chemical analysis.
Identifiers: *Atomic absorption spectroscopy, *Sensitivity, *Accuracy.

Water analyses by atomic absorption are compared to those by classical methods for the determination of iron, copper, zinc, manganese, calcium, and magnesium. Water-formed deposits are analyzed for iron, copper, magnesium, calcium, zinc, and nickel and the results are compared to those by gravimetric analyses. Silicon interference with iron and manganese determinations is eliminated by the addition of calcium. Potential interferences of phosphate, aluminum, and silicon with calcium and magnesium determinations are controlled by the addition of lanthanum. (Oleszkiewicz - Vanderbilt)
W73-11294

DETERMINATION OF TOTAL CHROMIUM IN FRESH WATERS BY ATOMIC ABSORPTION,
Geological Survey, Denver, Colo.
M. R. Midgett, and M. J. Fishman.
Atomic Absorption Newsletter, Vol 6, No 6, p 128-131, November-December 1967. 1 fig, 7 tab, 3 ref.

Descriptors: *Chromium, *Spectrophotometry, Freshwater, *Analytical techniques, Sampling, Separation techniques, Instrumentation, Oxidation, Trace elements, Water quality, Chelation, Indicators.
Identifiers: *Atomic absorption spectroscopy.

A rapid and sensitive atomic absorption method for the determination of chromium in fresh waters is described. Chromium is first oxidized to the hexavalent state with potassium permanganate and the excess permanganate reduced with sodium azide. The pH is then adjusted to 2.4 with hydrochloric acid, using bromophenol blue indicator, and chromium chelated with ammonium pyrrolidine dithiocarbamate. The metal chelate is extracted with methyl isobutyl ketone and the ketone layer containing the chromium chelate is then aspirated. As little as 1 microgram/l of chromium can be detected. (Oleszkiewicz - Vanderbilt)
W73-11295

THE DETERMINATION OF SMALL AMOUNTS OF MERCURY IN ORGANIC MATTER.

Analyst, Vol 90, No 1074, p 515-530, September 1965. 1 fig, 20 tab, 7 ref.

Descriptors: *Analytical techniques, *Spectrophotometry, *Mercury, *Organic matter, *Solvent extractions, Colorimetry, Metals, Separation techniques, Acids, Digestion, Distillation, Laboratory tests, Testing procedures, Measurements, Evaluation.
Identifiers: Dithizone.

Investigations were performed to find the most reliable and effective method to determine trace amounts of mercury in organic matter. In tests of the wet digestion method of sample preparation, organic samples containing Hg-203 labelled mercury lost appreciable amounts of Hg by volatilization. These losses may be overcome if the volatilized Hg is trapped and combined with digestate before determination. The addition of nitric acid would maintain oxidizing conditions during decomposition and reduce losses of Hg through distillation. Dithizone should be used for the extraction of mercury from the wet digestate. The method of mixed-color titration, the spectrophotometric method using dithizone to extract mercury and a similar method using a toluene solution of dithizone to extract mercury were tested as means of determining mercury concentrations. The findings of these tests are combined in a method of mercury extraction and determination which has a lower limit of approximately 0.5 micrograms (0.05 ppm). (Jerome - Vanderbilt)
W73-11296

DETERMINATION OF TRACE MERCURY IN SOIL AND ROCK MEDIA,
Colorado School of Mines, Golden. Dept. of Chemistry.
R. Z. Pyrih, and R. E. Bisque.
Economic Geology, Vol 64, p 825-828, 1969. 1 fig, 1 tab, 6 ref. US-GS Grant 14-08-001-G-12.

Descriptors: *Mercury, *Soils, *Rocks, *Geochemistry, Geologic investigations, Absorption, Instrumentation, Separation techniques, Analysis, Geological surveys, Spectrophotometry.
Identifiers: *Atomic absorption spectroscopy, Sensitivity, Accuracy.

The technique of mercury determination described requires an atomic absorption spectrophotometer and a relatively simple chemical procedure to obtain sensitive and accurate results for trace amounts of mercury. The lower limit of detection with this technique is 0.05 micrograms of mercury. Using a one gram sample, 50 parts per billion of mercury can be detected; increasing sample size will lower the detection limit to a few parts per billion, well below the average abundance of mercury in crustal rock, 0.08 parts per million. With access to an atomic absorption spectrophotometer, the proposed method is simple, convenient, inexpensive, and rapid. With adequate laboratory facilities and equipment, two men can digest and analyze 200-300 prepared samples per day. (Oleszkiewicz - Vanderbilt)
W73-11297

ATOMIC ABSORPTION SPECTROPHOTOMETRY IN THE FIELD OF MARINE RESEARCH,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
Atomic Absorption Newsletter, Vol 7, No 4, p 65-68, July-August 1968. 2 tab, 36 ref.

Descriptors: *Instrumentation, *Metals, *Water analysis, *Sea water, Oceanography, Geochemistry, Copper, Iron, Manganese, Zinc, Nickel, Cobalt, Strontium, Heavy metals, Trace elements, Analytical techniques, Laboratory tests, Water pollution.
Identifiers: *Atomic absorption spectroscopy, *Detection limit, Sensitivity, Accuracy, Marine chemistry.

Various applications of atomic absorption spectrophotometric analysis in the oceanographic sciences are reviewed, with examples predominantly in the field of marine chemistry and geochemistry. Particular emphasis is given to the instrumentation and techniques required for the determination of trace transition metals in marine waters and sediments. Detection limits for such metals as copper, iron, manganese and zinc are 0.1, 0.2, 0.07, and 0.1 mg/l respectively. (Oleszkiewicz - Vanderbilt)
W73-11298

TRACE ELEMENTS IN THE ATMOSPHERIC ENVIRONMENT,
Atomic Energy Research Establishment, Harwell (England).
D. H. Peirson, P. A. Cawse, L. Salmon, and R. S. Cambray.
Nature, Vol 241, No 5387, p 252-256, January 26, 1973. 4 fig, 2 tab, 35 ref.

Descriptors: *Trace elements, *Air pollution, Lead, Zinc, Iron, Aluminum, Calcium, Sodium, Mercury, Alkali metals, Heavy metals, Path of pollutants, Pollutant identification, Distribution, Rainfall, Seasonal.
Identifiers: Particulates, Washout, Deposition.

Some 30 elements have been determined quantitatively in aerosol samples from Wraymires, either as weekly or monthly concentrations. In addition, nine other elements have been qualitatively identified. The highest concentrations have been approximately 1 microgram per kg of air, in the case of Cl, Na and Ca. Next in abundance are Al, Fe, Pb and Zn. The total mass of particulates was about 20 microgram/kg of air. Over the limited period of measurement there was a general increase in the concentrations in air during the winter compared with summer, for a number of the elements measured. This was attributed to the seasonal reduction in the vertical diffusion in the atmosphere; it is associated with the increased frequency of temperature inversions during the winter. Certain derived parameters, 'washout factor' W and 'dry deposition velocity' V sub g, are summarized together with the total deposition T and dry deposition D, all as mean monthly values during the year 1971. (Oleszkiewicz - Vanderbilt)
W73-11299

AUTO EXHAUST - LEAD VS AROMATICS,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
J. M. Pierrard, and R. A. Crane.
Hydrocarbon Processing, Vol 50, No 9, p 142-146, September 1971. 4 fig, 6 tab, 17 ref.

Descriptors: *Aromatic compounds, *Lead, *Gasoline, Air pollution, *Air pollution effects, Gases, Smog, Fuels, Path of pollutants, On-site tests.
Identifiers: *Automobile exhausts, *Emissions, Vision, Tetraethyl-lead, Particles, Unleaded fuels.

Results are reported of an investigation to determine the effect of particulate emissions in vehicle exhaust on atmospheric soiling and visibility degradation. Leaded and unleaded gasolines were compared using 1969, 1970 and 1971 model automobiles. The two series of experiments described provided direct measurements of soiling and visibility degradation under realistic operating conditions. The tunnel fleet test data show that the light extinction coefficient after driving unleaded cars was approximately one and one-half times that after driving leaded cars. As visibility is inversely proportional to extinction coefficient the implication is that the contribution of automotive primary particulate matter to visibility reduction in St. Louis would increase from the present 1.5 to 2.1 percent if unleaded fuel were used. It is concluded that even this higher value caused by unleaded fuel is still a relatively insignificant contribution to air quality degradation in this instance. (Oleszkiewicz - Vanderbilt)
W73-11301

LEAD EMISSIONS FROM INCINERATED SEWAGE SLUDGE DETECTED ON TREE FOLIAGE,
Connecticut Agricultural Experiment Station, New Haven.
G. R. Stephens, L. Hankin, and W. D. Glover, Jr.
Journal of Air Pollution Control Association, Vol 22, No 10, p 799-800, October 1972. 2 tab, 11 ref.

Descriptors: *Lead, *Incineration, *Sewage sludge, *Heavy metals, Air pollution, Plants, Respiration, Trees, Copper, Nickel, Zinc, Chromium, Cadmium, Connecticut, Analytical techniques, Analysis, Spectrophotometry, Instrumentation, Path of pollutants, Precipitation.
Identifiers: *Atomic absorption spectroscopy, Tree foliage, Sensitivity.

A localized source of lead emission, incineration of sewage sludge derived from two heavily industrialized areas, is reported. Preliminary investigation suggested that lead in sewage sludge from one treatment facility was being emitted during incineration. An attempt was made to detect lead on vegetation near the incinerator. The foliage of trees in the vicinity of two sewage sludge incinerators was examined and its lead content was compared with that of foliage near a busy highway and in an isolated rural area. Daily inputs of other heavy metals (Cd, Cr, Cu, Pb, Ni, Zn) from incinerated sewage sludges are also reported. As opposed to other metals lead can be detected easily in the tree foliage. (Oleszkiewicz - Vanderbilt)
W73-11302

INCIDENCE OF MERCURY IN ILLINOIS PHEASANTS,
Illinois State Natural History Survey, Urbana.
W. L. Anderson, and P. L. Stewart.
Transactions of the Illinois Academy of Science, Vol 64, No 3, p 237-241, 1971. 1 tab, 12 ref.

Descriptors: *Mercury, *Soil contamination, *Game birds, *Illinois, Biochemistry, Chemical analysis, Pollutant identification, Bioindicators, Birds, Testing, Laboratory tests, Data collection, Sampling.
Identifiers: Pheasants.

Selected tissues from 20 pheasants collected in east-central Illinois during August 1970 were analyzed for elemental mercury by emission spectrography. Frequencies of occurrence and mean concentrations were 35 per cent and <0.06 ppm in kidneys, 40 per cent and 0.03 plus or minus 0.01 ppm in livers, 15 per cent and 0.32 plus or minus 0.30 ppm in brains, 25 per cent and 0.02 plus or minus 0.01 ppm in leg muscles, 15 per cent and 0.03 plus or minus 0.02 ppm in sternal muscles. The high mean concentration in brains was due to 5.93 ppm found in one bird. The second highest individual concentration was 0.44 ppm and occurred in kidneys. Eight soil samples, collected from the fields in which the pheasants were taken, contained a mean of 0.02 plus or minus 0.01 ppm of mercury. Thus, neither pheasants nor soils in east-central Illinois appear to be contaminated with potentially dangerous levels of mercury. (Jerome - Vanderbilt)
W73-11305

DITHIZONE PROCEDURE FOR MERCURY ANALYSIS,
Environmental Protection Agency, Grosse Ile, Mich. Lake Huron Basin Office.
C. T. Elly.
Journal of the Water Pollution Control Federation, Vol 45, No 5, p 940-945, May 1973. 3 fig, 2 tab, 4 ref.

Descriptors: *Pollutants, *Mercury, *Pollutant identification, *Analytical techniques, Water pollution, Sources of water pollution, Metals, Spectrophotometry, Chemical degradation, pH, Laboratory tests, Testing procedures, Instrumentation, Chemical analysis.
Identifiers: Dithizone.

Tests of the rapidity, sensitivity, reliability and economy of the dithizone method of mercury extraction were performed. The mercury was determined by extraction of mercuric ion with a chloroform solution of dithizone in 1N sulfuric acid solution. At a pH of 0.3 metals such as lead, cadmium, zinc, nickel, cobalt, iron and copper did not interfere. The addition of acetic acid stabilized the mercury-dithizone complex for at least 1 hour. Beer's Law was followed over a concentration range of 0.002 to 0.040 mg/l of mercury (II). In a precise study a relative standard deviation of 3.0% was obtained. Maximum absorptivity of this complex is at 500 M microns. The advantages of this procedure are low relative standard deviation and low relative error, low cost and simplicity of reagents and equipment. Disadvantages include free chlorine interference, possible copper (I) and iron (III) interference, variables affecting the sensitivity, questionable ability to measure all forms of mercury without digestion and inability to detect amounts less than 2 micrograms/l of mercury (II). (Jerome - Vanderbilt)
W73-11306

TRACE METAL CONTENT OF HAIR, I. ZINC AND COPPER CONTENT OF HUMAN HAIR IN RELATION TO AGE AND SEX,
Cincinnati Univ., Ohio. Coll. of Medicine, and Cincinnati Univ., Ohio. Dept. of Environmental Health.
H. G. Petering, D. W. Yeager, and S. O. Witherup.
Archives of Environmental Health, Vol 23, No 3, p 196-201, September 1971. 3 fig, 1 tab, 17 ref.

Descriptors: *Bioassay, *Spectrophotometry, *Copper, Zinc, *Statistics, Biochemistry, Metals, Trace elements, Analytical techniques, Toxicity, Toxins, Testing procedures, Data collections, Sampling, Metabolism.
Identifiers: Human hair, Human physiology.

The zinc and copper levels in the hair of a group of 211 persons of both sexes and in an age range from 1 to 80 years were analyzed. The hair was obtained from volunteers when they had their hair cut by a barber. The hair was washed with solvents and detergents and dried. The samples were then ashed and subjected to atomic absorption spectrophotometry. Statistical analysis plots were performed for age and sex. The average accuracy of the method exceeded 96%. Graphs show the zinc and copper concentration plots for age and sex. The content of zinc in the hair of males increased from 105 ppm at age 2 to 180 ppm at age 15 and then slowly decreased to 125 ppm at age 80. Copper concentrations started at about 13 ppm at age 2, increased to 60 ppm at age 12 and decreased to 9 or 10 ppm at age 80. The average content of zinc in the hair of females was very similar to that in males at a comparable age. Copper concentrations in female hair showed an insignificant rise with age. Suggestions are made for testing and plotting of trace metal concentrations in hair. (Jerome - Vanderbilt)
W73-11308

CATION EXCHANGE SEPARATION OF METAL IONS WITH POTASSIUM CHLORIDE--CHELATING AGENT-ORGANIC SOLVENT MEDIUM,
Yonsei Univ., Seoul (Republic of Korea). Dept. of Chemistry.
K. S. Lee, D. W. Lee, and S. W. Kang.
Analytical Chemistry, Vol 43, No 7, p 876-879, June 1971. 3 fig, 5 tab, 7 ref.

Descriptors: *Cation exchange, *Potassium, *Chelation, *Metals, Separation techniques, Chemical analysis, Ions, Hydrogen ion concentration, Chemical reactions, Industrial wastes.
Identifiers: *Metal ions, Potassium chloride, Organic solvents.

The cation exchange behavior of several metal ions toward Dowex 50W-X8,K (+) form, has been investigated in KC1-methanol or KC1-chelating agent-organic solvent medium as an eluent. Distribution coefficients and volume distribution coefficients in these media have been measured. By the addition of a chelating agent, such as salicylic and sulfosalicylic acid, and glycine, several separations of the synthetic mixtures were performed successfully. (Oleszkiewicz-Vanderbilt)
W73-11311

OPERATION OF THE ANALYTICAL METHODOLOGY INFORMATION CENTER,
Battelle Columbus Labs., Ohio.
R. L. Little, and R. L. Darby.
Copy available from GPO Sup Doc as EP1.23/5:73-011, $2.35; microfiche from NTIS as PB-221 491, $0.95. Environmental Protection Agency, Monitoring Series Report, EPA-R4-73-011, April 1973. 162 p, 9 fig, 16 tab, 3 ref. EPA Project 16020 HJE. 68-01-0166.

Descriptors: *Information retrieval, *Data collections, *Analytical techniques, Methodology, Automation, Digital computers, Publications, *Bibliographies, Toxicity, Data storage and retrieval, Data processing, Pollutant identification.
Identifiers: *Information centers, Information storage and retrieval systems, Interactive information systems.

Details are given for the first year of full-scale operation of the Analytical Methodology Information Center which was designed to collect, process, and disseminate information on analytical methods related to aquatic and marine environments for the Analytical Quality Control Laboratory and other elements of the National Analytical Methods Development Research Program. The main activities of the Center included an extensive acquisitions program, abstracting and indexing at the rate of about 200 items per month, providing abstracts to the Water Resources Scientific Information Center, publication of an abstract bulletin, maintenance of a computerized information/data base which is on-line interactive, provision of limited loan and copy services, and availability of quick response inquiry services. The value of the interactive information/data base has been further enhanced by the addition of chemical effects (toxicity) data. An additional study was conducted to evaluate the usefulness of SDI services to selected staff members as a means of broadening the AMIC screening process. An extensive group of EPA staff has been served by the Center via the abstract bulletin, the interactive information/data base, the loan and copy services, and the quick response inquiries. Because of interest in these activities outside EPA, plans are underway to permit access to these services on a cost-recovery basis. Recommendations are included for continued operation of the Center. (See also W72-01994) (EPA)
W73-11336

INTERACTION OF NITRILOTRIACETIC ACID WITH SUSPENDED AND BOTTOM MATERIAL,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
J. K. Taylor, R. Alvarez, R. A. Paulson, T. C. Rains, and H. L. Rook.
Copy available from GPO Sup Doc as EP1.16:16020 GFR 07/71, $0.45; microfiche from NTIS as COM-72-50572, $0.95. EPA Water Pollution Control Research Series, July 1971. 31 p, 12 tab, 8 ref. EPA Project 16020 GFR.

Descriptors: *Detergents, *Absorption, Analytical techniques, *Neutron activation analysis, *Nitrilotriacetic acid, Pollutant identification, *Bottom sediments, *Suspended solids, Trace elements, Solubility.

An experimental investigation was made of the possible interaction of residual concentrations of nitrilotriacetic acid in surface waters with metallic elements contained in sediments and bottom materials. Samples of bottom materials from typical bodies of surface waters were analyzed for their major, minor, and trace constituents. Eight representative samples of these were equilibrated with distilled water and with water containing 20 ppm of NTA and the resulting solutions were analyzed by three analytical techniques. Elements showing essentially no increased solubility in the presence of NTA were: barium, antimony, molybdenum, strontium, chromium, silver, tin, iron, lead, cadmium, copper, and mercury. Elements showing small increases in solubility were: nickel, zinc, manganese, and cobalt. Calcium and magnesium concentrations were increased somewhat above their normal relatively high concentrations. (EPA)
W73-11339

PHOTOGRAPHIC WATER CONSERVATION AND RECLAMATION PROCESSES STUDY,
Eastman Kodak Co., Rochester, N.Y.
J. W. Gibson.
Available from NTIS, Springfield, Va 22151 as AD-752 220 Price $3.00 printed copy; $0.95 microfiche. Air Force Avionics Laboratory Report AFAL-TR-72-273, Wright-Patterson Air Force Base, May 1972. 92 p, 14 fig, 8 tab. USAF Contract F33615-71-C-1353.

Descriptors: *Aerial photography, *Films, *Photography, Physical properties, Research and development, Laboratory tests, Testing procedures, Water quality, Materials testing, Technology, Research equipment, Water pollution effects.
Identifiers: *Photo-film processing, Film storage time, Deleterious photographic effects.

The usability characteristics were determined for black-and-white aerial reconnaissance and duplicating film under conditions of minimal washing and under less than optimum storage temperatures and humidity. Also, the amount of washing

needed was determined for a Kodak Versamat Film Processor, Model 11C-M, to obtain film quality that is consistent with the needs of tactical aerial reconnaissance. For this purpose, the wash section of a Versamat Film Processor was modified to demonstrate operation with reduced water supply. The effect on photographic chemicals of contaminants normally found in water was investigated, and test procedures for evaluating the suitability of water for photographic processing were developed. Water quality studies showed that among the potential water contaminants studied deleterious photographic effects for black-and white processing are caused by (1) high calcium hardness, (2) sulfides, and (3) elemental sulfur. (Woodard-USGS)
W73-11403

INVESTIGATIONS INTO THE OCCURRENCE OF COLIFORM ORGANISMS FROM PRISTINE STREAMS,
Michigan State Univ., East Lansing. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-11428

THE RELATIONSHIP OF ENZYME KINETIC HETEROTROPHY ANALYSIS TO OTHER EUTROPHICATION INDICES,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 05C.
W73-11432

STANDARD DISPERSANT EFFECTIVENESS AND TOXICITY TESTS,
Edison Water Quality Research Lab., N.J.
L. T. McCarthy, Jr., I. Wilder, and J. S. Dorrier.
Copy available from GPO Sup Doc as EP1.23/2:73-201, $0.90; microfiche from NTIS as PB-221 548, $0.95. Envrionmental Protection Technology Series Report EPA-R2-73-201, May 1973. 57 p, 5 fig, 12 tab, 6 ref.

Descriptors: *Oil pollution, Standards, *Bioassay, *Toxicity, Emulsifiers, *Testing, Dispersion.
Identifiers: *Dispersant tests, *Dispersnat toxicity tests.

A brief history of the development of the Standard EPA Dispersant Effectiveness and Toxicity tests is outlined. The standard tests are presented and discussed. An analysis of variance is performed on the data developed by three independent laboratories in order to determine the reproducibility of standard test procedures. In the standard effectivenuss test, oil is applied to the water surface in a cylindrical tank. Dispersant is applied in a fine stream and then mixing energy is supplied by a pressurized water stream. The tank contents are recirculated after which samples are withdrawn for extraction and spectrophotometric analysis. The standard toxicity test involves exposing three species (Pimephales promelas, Fundulus heteroclitus, and Artemia salina) to dispersant and oil/dispersant mixtures. From these tests a curve relating organism survival to material concentrations is developed to determine median tolerance limits. Separate discussion sections include the statistical analyses of 'testing the test' results for reproducibility and the rationale for selecting the test procudures as presented. (EPA)
W73-11442

ADSORPTION OF CHLORINATED HYDROCARBONS FROM SEAWATER BY A CROSSLINKED POLYMER,
Woods Hole Oceanographic Institution, Mass.
G. R. Harvey.
Copy available from GPO Sup Doc as EP1.23/2:73-177, $0.55; microfiche from NTIS as PB-213 954, $0.95. Environmental Protection Agency Technology Series Report EPA-R2-73-177, March 1973. 26 p, 2 fig, 1 tab, 10 ref. EPA Project 16020 GCO.

Descriptors: *Adsorption, *DDT, *Polychlorinated biphenyls, Organic compounds, *Resins, *Monitoring, *Chlorinated hydrocarbon pesticides.

A synthetic resin, Amberlite XAD-2, has been evaluated as an adsorption medium for chlorinated hydrocarbons dissolved in seawater. The resin was very efficient and the method was developed into a routine analytical procudure for the monitoring of seawater. (EPA)
W73-11443

PYROGRAPHIC GROSS CHARACTERIZATION OF WATER CONTAMINANTS,
Rocketdyne, Canoga Park, Calif.
I. Lysyj, and P. R. Newton.
Copy available from GPO Sup Doc as EP1.23/2:73-227, $1.25; microfiche from NTIS as PB-221 551, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-227, May 1973. 94 p, 10 fig, 15 tab, 5 ref. EPA Project 16040 EXD. Contract No. 14-12-802.

Descriptors: *Water pollution, Monitoring, Water analysis, Gas chromatography, *Waste identification, *Pollutant identification.
Identifiers: *Waste source quantification,*Pyrographic methodology.

A hydrochemical instrumenta and methodology were developed for direct analysis of organic materials in aqueous solutions based on thermal fragmentation followed by gas chromatographic separation and detection of the resulting derivative compositions. The applications of the developed technique to water pollution surveillance, optimization of waste treatment processes, and characterization of natural waters were studied. A recorded pattern of pyrolytically produced fragments for a given water sample reflects the total nature of its organic composition, and can be interpreted and differentiated in a number of ways. Using a priori established calibration patterns for individual components to be found in a mixture, the pattern produced by a mixture can be analyzed mathematically. The system can be calibrated and the data can be interpreted in terms of pure organic compounds, classes of organic materials, or any other arbitrarily defined organic mixtures such as those found in industrial waste effluents. Application of this technique to pollution surveillance is based on the fact that each industry has a waste whose chemical composition is distinctive to its operation. The uniqueness of such waste compositions offers a means for their characterization as separate entities, rather than as a collection of various chemical species. The validity of this postulate was experimentally demonstrated. With this method, both the identity of the source and the quantity of the waste contributed by each source could be determined. (EPA)
W73-11446

A FLOW PROPORTIONAL COMPOSITE SAMPLER,
Wisconsin State Univ., Platteville.
H. J. Jebens, and R. H. Thomas.
Water and Sewage Works, Vol 117, No 9, p 326-327, September 1970. 2 fig.

Descriptors: Sampling, *Water sampling, Waste water treatment, Treatment facilities, Pumps, *Flow measurement, Flow rates, Domestic wastes, Pollution abatement, Wisconsin.
Identifiers: Sensors, Submersible pumps, *Sampling equipment, *Flow proportioning.

In a recent study of a number of small waste water treatment plants in Wisconsin, a versatile sampling device was developed for use in small plants where some type of flow metering was available. It was desirable to develop a device which was: (1) fully automatic; (2) easy to install; (3) free from maintenance; (4) adaptable to small treatment plants; (5) capable of flow proportioning a sample; and (6) inexpensive. The sampler developed consists of four component parts: a submersible sampling pump, a sample diversion box, an electronic timer and a sensor mated to the counter of the treatment plant flow totalizer. The sampler, including pumps, extension cords, and sample bottles, cost less than $200.00 to build and provided up to three individual sampling points at a given treatment plant. Experience over a nine month trial period has indicated that the system is accurate, maintenance free and reliable for the sampling of domestic waste waters. (Campbell-NWWA)
W73-11463

DETERMINATION OF CARBOHYDRATE IN LAKE SEDIMENT BY A MODIFIED PHENOL--SULFURIC ACID METHOD,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
D. Liu, P. T. S. Wong, and B. J. Dutka.
Water Research, Vol 7, No 5, p 741-746, May 1973. 4 fig, 9 ref.

Descriptors: *Carbohydrates, *Lake sediments, *Chemical analysis, *Spectrophotometry, *Methodology, Sampling, Color reactions, Aquatic soils, Soil analysis, Assay, Cores, Phenols, Lake Erie, Lake Ontario, Chemical reactions.
Identifiers: *Phenol-sulfuric acid method, Sample preparation, Reproducibility, Sensitivity, Chemical interference, Absorbance.

A spectrophotometric method for the assay of carbohydrates in lake sediments and soil is described that is based on the measurement of color development in phenol-sulfuric acid at 485 nm. Sediment core samples were taken with a Benthos corer from Lake Erie and Lake Ontario, stored at 4C and extruded within 48 h of collection. Samples (10 g) from each subsection (0-2, 5-7, 10-12, and 20-22 cm) were processed immediately for carbohydrate and dry weight determination. Dry weights were obtained by heating the sample overnight at 105C. Distilled water and phenol solution were added to a 2-50 mg wet weight sample and thoroughly mixed. Concentrated H_2SO_4 was added to the mixture which was subsequently allowed to stand at room temperature for 10 minutes. It was centrifuged for another 10 minutes and carbohydrate determinations were made as stated above. Studies of the effects of phenol and carbohydrate on the method showed 100 mg phenol/sample and 0-100 micrograms carbohydrate gave the best results. This highly reproducible and sensitive assay technique requires only 20 minutes and as little as 2 mg wet weight of sample. (Holoman-Battelle)
W73-11482

ULTRAPURITY IN TRACE ANALYSIS,
Belle Labs., Murray Hill, N.J.
J. W. Mitchell.
Analytical Chemistry, Vol 45, No 6, p 492-500, May 1970. 6 fig, 5 tab, 62 ref.

Descriptors: *Analytical techniques, *Trace elements, Reviews, Laboratory equipment, Water analysis, Neutron activation analysis, Gas chromatography, Air pollution, Manganese, Nickel, Copper, Cobalt, Chromium, Zinc, Iron, Sulfur, Heavy metals, Polarographic analysis.
Identifiers: *Quality control, *Chemical interference, *Reagents, *Ultrapure water, *Blanks, Sample preparation, Detection limits, Stable isotope dilution, Nuclear track counting, Anodic stripping voltammetry, Electron capture gas chromatography, X-ray fluorescence, Optical fluorescence, Spectrophotofluorometry, Atomic absorption spectrophotometry, Vanadium.

An attempt is made to provide a current reference for analytical chemists, materials scientists, and others responsible for the preparation or practical characterization of ultrapure materials. A summary of procedures used for trace analysis and other advances in methods and techniques are presented, major obstacles to extending the limits for determining trace elements are discussed, and developments required in the future are treated. (Little-Battelle)
W73-11483

ANODIC STRIPPING VOLTAMMETRY AT A TUBULAR MERCURY-COVERED GRAPHITE ELECTRODE,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
W. R. Seitz, R. Jones, L. N. Klatt, and W. D. Mason.
Analytical Chemistry, Vol 45, No 6, p 840-844, May 1973. 5 fig, 3 tab, 14 ref.

Descriptors: *Water analysis, *Sea water, Calibrations, Electrodes, Flow rates, Measurement, Lead, Cadmium, Copper.
Identifiers: *Anodic stripping voltammetry, *Thallium, Masking, Chemical interference, Tubular mercury-covered graphite electrode, Plating potential, Plating time, Reproductibility, Sensitivity.

A procedure was developed for preparing a tubular mercury-covered graphite electrode (TMCGE) for doing anodic stripping voltammetry (ASV) in a flowing system. The TMCGE was evaluated using thallium in the presence of .01 M EDTA to mask other metals. The effects of varying plating potential, plating time and flow rate on the TI stripping peak were as theoretically expected, and linear calibrations of TI peak height vs concentration were obtained over the ranges of 2-10 times 10 to the minus 7 M, 2-10 times 10 to the minus 8M, and 2-10 times 10 to the minus 9 M at plating times of 3, 8 and 30 minutes, respectively. The current at any point in the tubular electrode with a flowing system is proportional to one over the cube root of the distance from the upstream end of the tube. Since the upstream end of the TMCGE has the highest current density of any point in the tube, impurities accumulate in this region causing this part of the mercury surface to deteriorate more rapidly. (Little-Battelle)
W73-11484

DETERMINATION OF PHENOLS AND AROMATIC AMINES BY DIRECT TITRATION WITH BROMINE IN PROPYLENE CARBONATE,
Alberta Univ., Edmonton. Dept. of Chemistry.
R. D. Krause, and B. Kratochvil.
Analytical Chemistry, Vol 45, No 6, p 844-848, May 1973. 1 fig, 3 tab, 9 ref.

Descriptors: *Volumetric analysis, *Phenols, *Bromine, Organic acids.
Identifiers: *Propylene carbonate, *Aromatic amines, *Stoichiometry, 2-Naphthol, p-Nitrophenol, Salicyclic acid, Methyl salicylate, p-Cresol, Thymol, Resorcinol, Cresols, Aniline, p-Nitroaniline, Anthranilic acid, n-Phenylenediamine, p-Toluidine, p-Phenetidine, Amines, Precision, Accuracy.

Propylene carbonate is used as a medium for bromine substitution reactions. A series of aromatic amines and phenols were determined with accuracies of about 1 percent and precisions of a few ppt. A base such as pyridine must be present to accept protons released in the substitutions. Advantages include rapidity of the reactions, solubility of reactants and products, and convenient standardization of bromine with solutions of bromide. The log formation constant of Br3 (-) in propylene carbonate at zero ionic strength is 7.37. (Little-Battelle)
W73-11485

ORGANIC LOADING OF PETENWELL RESERVOIR, WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-11486

MASS SPECTROMETRIC IDENTIFICATION OF SOME BIS-2,4-DINITROPHENYLHYDRAZONES,
Southern Regional Research Lab., New Orleans, La.
J. B. Stanley, V. J. Senn, D. F. Brown, and F. G. Dollear.
Applied Spectroscopy, Vol 27, No 2, p 141 March/April 1973. 1 tab, 4 ref.

Descriptors: *Mass spectrometry, Organic compounds.
Identifiers: *Mass spectra, *bis-2,4-Dinitrophenylhydrazones, Glyoxal, Methylglyoxyal, Pyruvic aldehyde, Diacetyl 2 3-Pentanedione, 4-Methyl pent-3-ene-2-one-l-al, 2 5-Hexanedione, Methyl vinyl ketone, 4 5-Octanedione, 2-Oxononanal.

Some features are described of mass spectra obtained from the bis-2,4-dinitrophenylhydrazones (2,4-DNPH) of some aldehydes and ketones. The spectra were obtained on a CEC 21-110B mass spectrometer. The presence of M-183 and mass 183 peaks could be diagnostic of bis-2,4-DNPH's, analogous to the characteristic fragmentation peaks of mono-n-aldehyde and n-ketone 2,4-DNPH's. (Little-Battelle)
W73-11487

CARBON DIOXIDE DYNAMICS: A RECORD OF ORGANIC CARBON PRODUCTION, RESPIRATION, AND CALCIFICATION IN THE ENIWETOK REEF FLAT COMMUNITY,
Hawaii Univ., Honolulu. Dept. of Oceanography.
S. V. Smith.
Limnology and Oceanography, Vol 18, No 1, p 106-120, January 1973. 7 fig, 1 tab, 43 ref.

Descriptors: *Primary productivity, *Monitoring, *Hydrogen ion concentration, *Alkalinity, *Marine algae, *Coral, *Respiration, *Carbon dioxide, Reefs, Sea water, Water analysis, Flow rates, Metabolism, Calcium carbonate.
Identifiers: *Calcification, Eniwetok Atoll.

Samples of sea water were collected before and after flowing over the Eniwetol reef flat and analyzed for alkalinity, pH, and carbon dioxide to determine whether CO2 content could be used to monitor organic carbon production, respiration, and calcification in the marine environment. Changes in pH and alkalinity were used to partition the CO2 changes into those due to production-respiration and those due to calcification. The results showed that both a transect visually dominated by a mixture of corals and algae and a transect dominated by an algal turf calcified at an average rate of 4,000 g CaCO3 per square mile per year, with no apparent day-to-night difference. Although nighttime respiration on both transects was 0.12 g C per square mile per hour, the algal transect exhibited a much higher daytime net production rate than did the coral-algal transect (0.72 vs 0.25 g C per square mile per hour). Although little particulate CaCO3 was removed from the reef flat during these studies, there has been virtually no net CaCO3 accumulation there over the last several thousand years. The technique applied to flowing water respirometry is demanding on present capabilities of resolution; however, it should be easily applicable in incubation chambers or in natural water, low-flow rate situations. (Little-Battelle)
W73-11488

RECENT DEVELOPMENTS IN THE ANALYTICAL APPLICATION OF UV PHOTOELECTRON SPECTROSCOPY,
University Coll. of Swansea (Wales). Dept. of Chemistry.
D. Betteridge, A. D. Baker, P. Bye, S. K. Hasanuddin, and N. R. Kemp.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 286-290, March 1973. 5 fig, 11 ref.

Descriptors: *Data processing, *Computer programs, Laboratory equipment, Gas chromatography, Chlorides.
Identifiers: *UV-photoelectron spectroscopy, *Sample inlet, *GC-photoelectron spectroscopy, Acetone, Solvents, Organic solvents, Hydrochloric acid, Phosphorus pentachloride, Phosphorus oxychloride.

Preliminary results are reported from a number of new developments designed to make UV photoelectron spectroscopy analytically advantageous. A versatile photoelectron spectrometer with a simple sample inlet system has been constructed. This has been successfully linked to a G.L.C. and in this combination serves either to provide a spectrum of the sample or acts as a selective G.C. detector. Data processsing has been improved with aid of a computer program which enables the spectrum of a mixture to be resolved into its components. The system was tested with acetone, PC15, POC15, and HC1. (Little-Battelle)
W73-11489

FERROUS IRON AND THE GROWTH OF TWENTY ISOLATES OF PHYTOPHTHORA INFESTANS IN SYNTHETIC MEDIA,
West Virginia Univ., Morgantown. Div. of Plant Sciences.
V. M. Cuppett, and V. G. Lilly.
Mycologia, Vol 65, No 1, p 67-77, January-February, 1973. 3 tab, 25 ref.

Descriptors: *Cultures, *Growth rates, Iron, Aquatic fungi.
Identifiers: *Culture media, *Phytophthora infestans.

Twenty isolates of Phytophthora infestans grew well in a D-glucose-L-asparagine medium containing 1.0 ppm of ferric iron provided that 200mg/liter of L-ascorbic acid were added. Under these conditions ferric iron was reduced to the ferrous state. Most of the isolates ferric iron after variable periods of incubation. Growth in media not containing L-ascorbic acid was associated with the reduction of ferric iron. (Little-Battelle)
W73-11490

ACQUISITION AND REDUCTION OF GAS CHROMATOGRAPHIC DATA USING A COMPUTER,
Societa Italiana Resine S.P.A., Sassari (Italy). Laboratorio Chimico.
M. Greco, and G. Marranci.
Journal of Chromatography, Vol. 77, No 1, p 91-96, March 14, 1973. 4 tab.

Descriptors: *Gas chromatography, *Computers, Carbon dioxide, Nitrogen, Oxygen, Hydrogen, Laboratory equipment, Computer programs, Automation.
Identifiers: *Data reduction, Alkyl benzenes, Xylene, Paraffins, Dichloroethane, Naphtha, Olefins, Carbon monoxide, Chlorinated hydrocarbons, Chromatograms.

Installation is described of an IBM 1800 computer system for the on-line acquisition and reduction of data from twenty gas chromatographs. Gas chromatographs from various manufacturers that use both packed and capillary columns and thermal conductivity and flame ionization detection were interfaced to the computer. The gas chromatography computer system has been used for a wide range of applications, from routine analyses to research and development. The accuracy and repeatability of quantitative data and retention times are shown. Routine analyses were run on C1-C5 gases, alkylbenzenes, p-xylene oxidation products, n-paraffins, pyrolysis samples, H2, O2,

N2, CO, CO2, aromatics, halogenated compounds from 1,2,dichloroethane, naphtha, and olefins. The computer installation required particular studies on the layout of signal cables from the gas chromatography laboratory, of electric cables and of pneumatic lines. (Little-Battelle)
W73-11491

LOW COST MULTICHANNEL SCANNING PH--STAT,
Groningen Rijksuniversiteit (Netherlands). Dept. of Microbiology; and Groningen Rijksuniversiteit (Netherlands). Central Electronics Service.
J. G. Kuenen, P. Cuperus, and W. Harder.
Laboratory Practice, Vol 22, No 1, p 36-38, January 1973. 3 fig, 3 ref.

Descriptors: *Cultures, *Hydrogen ion concentration, *Control systems, *Automatic control, Microbiology, Bacteria, Laboratory equipment, Design.
Identifiers: *pH stat.

A scanning pH-stat is described which can control the pH in 12 cultures. The instrument consists of a commercial on/off pH controller connected to a generator giving a pulsating DC voltage which operates a magnetic valve. Opening the valves results in either the addition of alkali or acid to the culture. The scanner functions as a multiposition switch connecting a specific pH electrode to the corresponding magnetic valve. Depending on the capacity of the switch any number of electrodes and magnetic valves can be accomodated. In the system constructed, 12 positions were used. A time basis generator operates a solenoid which actuates the 12 position switch to monitor each culture and provide pH correction. The scanner has been essentially trouble free during more than two years of operation. (Little-Battelle)
W73-11492

COMPARISON OF SELECTIVE ION MONITORING AND REPETITIVE SCANNING DURING GAS CHROMATROGRAPHY-MASS SPECTROMETRY,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
B. S. Middleditch, and D. M. Desiderio.
Analytical Chemistry, Vol 45, No 4, p 806-808, April 1973. 2 fig, 1 tab, 19 ref.

Descriptors: *Laboratory tests, Methodology, Chemical analysis, Organic compounds.
Identifiers: *Selective ion monitoring, *Repetitive scanning, *Sensitivity, *Versatility, *GC-Mass spectrometry, Biochemical analysis, Method evaluation, Mass spectra, Cholestane, Accuracy, Trace levels.

Because of the increasing applicability of repetitive scanning (RS) and selective ion monitoring (SIM) gas chromatography-mass spectrometry to biochemical problems, an investigation using cholestane as a test substance was carried out to determine the relative sensitivities, limitations and versatilities of the two methods. Three-microliter aliquots of cholestane stock solution diluted by a factor of 10 from 10 to 1,000,000 times were used for GC-MS to facilitate accuracy of injection volumes. The results indicate that, under similar conditions, the RS and SIM methods provide similar sensitivities. Under the optimum conditions for each method, SIM is capable of far greater sensitivity. The choice of technique to be used depends, to a great extent, on the availability of facilities for automated data handling. The SIM method is preferable for the detection and measurement of trace quantities. (Holoman-Battelle)
W73-11493

POPULATION STUDIES OF THREE AQUATIC GASTROPODS IN AN INTERMITTENT BACKWATER,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
J. W. Eckblad.
Hydrobiologia, Vol 41, No 2, p 199-219, March 29, 1973. 4 fig, 9 tab, 40 ref.

Descriptors: *Snails, *Dry beds, *Standing crops, *Productivity, Biomass, Backwater, On-site investigations, Population, Invertebrates, Drought, Tolerance, Dry seasons.
Identifiers: *Survival, Lymnaea palustris, Phusa integra, Gyraulus parvus, Macroinvertebrates, Turnover ratio.

Three snail populations of an intermittent backwater were studied over a 20-month period, and estimates were made of rate of population change, mean biomass, annual and summer net production, and survival under conditions of little standing water. Lymnaea palustris and Physa integra populations were essentially univoltine, while Gyraulus parvus appeared to produce several generations during the year. L. palustris formed a protective epiphragm and was apparently better suited to recurrent dry periods that either G. parvus or P. integra. The population density of G. parvus was usually well below, and more aggregated, than the other two species. The estimated annual production rates for L. palustris and P. integra were 2.18 g/sq m and 1.59 g/sq m, respectively, and these two species accounted for about 98 percent of the total gastropod production. About 75.9 percent and 66.5 percent of the L. palustris and P. integra production, respectively, occurred between June and November. Summer turnover ratios in 1969 were 4.69 for L. palustris and 2.94 for P. integra. An extended dry period early in the summer of 1970 reduced total snail production to about 18-24 percent of that of the previous season, although summer turnover ratios were fairly consistent. (Little-Battelle)
W73-11494

SPECTROPHOTOMETRIC METHOD FOR DETERMINATION OF OZONE IN AQUEOUS SOLUTIONS,
Hadassah Medical School, Jerusalem (Israel).
H. Shechter.
Water Research, Vol 7, No 5, p 729-739, May 1973. 5 fig, 3 tab, 24 ref.

Descriptors: *Spectrophotometry, *Ozone, *Methodology, *Kinetics, *Aqueous solutions, *Pollutant identification, *Water analysis, Oxidation, Viruses, Volumetric analysis, Chemical analysis, Chemical reactions, Disinfection, Bacteria, Water temperature, Cultures.
Identifiers: *Inactivation, Reproducibility, Dissolved gases, Sensitivity, Mast reagent, Method evaluation, Stirring rate.

A sensitive spectrophotometric method for determination of ozone in small volumes of water was performed in order to meet the requirements of a kinetic study of virus and bacteria inactivation by ozone. The proposed method involves oxidation of a buffered iodine solution and spectrophotometric measurement of the triiodide ion liberated by ozone. Two procedures are used: one for low ozone concentration (0.01-0.30 ppm) and another for higher concentrations (0.30-2.0 ppm). In order to establish the precision of the proposed method, 6 parallel determinations were carried out, in a consecutive order, at different 03 concentrations (0.05-0.33 ppm and 0.23-1.92 ppm). Reproducibility was very high when the procedure used corresponds with the ozone level for which it was intended. The comparative results obtained from ozone determinations by spectrophotometry using neutral KI reagent or Mast reagent, and by the standard volumetric method showed the volumetric readings to be greater than those of spectrophotometry. Some applications of the method for a kinetic study of virus inactivation by ozone are presented and the optimal conditions for such applications have been established. (Holoman-Battelle)
W73-11495

PROGRESS REPORT OF RESIDUE STUDIES ON ORGANIC ARSENICALS USED FOR DITCHBANK WEED CONTROL,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 04A.
W73-11497

FALLING-DROP TECHNIQUE FOR SILT-CLAY SEDIMENT ANALYSIS,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
J. M. Pezzetta.
Available NTIS, Springfield, Va. 22151 as COM-73-10228 Price $3.00 printed copy; 95 cents microfiche. Wisconsin University Sea Grant Technical Report WIS-SG-72-215, July 1972. 204 p, 7 fig, 7 tab, 87 ref, append.

Descriptors: *Sediments, *Particle size, *Silts, *Clays, Analytical techniques, Settling velocity, Laboratory tests, Particle shape, Sedimentology, Sediment transport.
Identifiers: Sediment analysis.

The falling drop method for analyzing the textural characteristics of silts and clays down to a particle diameter of about 1 micron is presented as a tractable laboratory procedure for routine investigations of fine-grained sediments. Size classification is based on the calculated settling times of sedimentary particles using either Wadell's formula or Stokes' law, the former being preferred since it allows for the effects of grain shape on the settling velocity. The weights or concentrations associated with each class interval sampled at the corresponding settling times are determined on the basis of the fall time of a drop of sediment suspension in a nonmiscible organic fluid. The latter procedure represents a substantial improvement over the standard pipetting technique in that is obviates the need for weighing and drying aliquot samples. Additional information includes formulas, settling times, and other data normally required in a sedimentology laboratory but which are generally scattered throughout the literature or in several handbooks. (Woodard-USGS)
W73-11558

CONTINUOUS CULTURE OF RHODOTORULA RUBRA: KINETICS OF PHOSPHATE-ARSENATE UPTAKE, INHIBITION, AND PHOSPHATE-LIMITED GROWTH,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button, S. S. Dunker, and M. L. Morse.
Journal of Bacteriology, Vol 113, No 2, p 599-611, February 1973. 8 fig, 5 tab, 38 ref.

Descriptors: *Kinetics, *Phosphates, *Absorption, *Hydrogen ion concentration, Inhibition, Growth rates, Nutrient requirements, Yeasts, Cultures, Radioactivity techniques, Bioassay, Toxicity, Equations, Sodium chloride, Population.
Identifiers: *Rhodotorula rubra, *Electron transport, Arsenates, Bioaccumulation, Scintillation counting, P-32, As-73.

The kinetics of phosphate uptake, growth limitation, and inhibition of arsenate transport in Rhodotorula rubra are described in view of their relevance to microbial processes in dilute aquatic environments. R. rubra is a pink yeast which was recently isolated from sea water and is able to grow in continuous culture systems at low pH and at low phosphate concentrations. Population density averages were determined from routing plate counts and with a model B Coulter counter. Uptake rates were determined by scintillation counts of P-32-labelled phosphorus; arsenate was determined by As-73 labelling. The yeast was capable of extended growth at very low phosphate concentrations (Concentration at one half maximal growth rate was 10.8 nanomoles). Average intracellular phosphate concentrations, based on isotope exchange techniques, were 15 to 200 millimoles, giving concentration geadients across the cell envelope of about one million. Inability of the

phosphate transport system to discriminate against arsenate transport led to arsenate toxicity at 1 to 10 nanomoles. Phosphate competitively prevented arsenate toxicity. Phosphate uptake experiments showed that maximal growth rates could be achieved with approximately 4 percent of the total phosphate-arsenate transport system. Organisms adapted to a range both of concentration of NaCl and of pH. Phosphate initial uptake rates that were in agreement with the steady-state flux in continuous culture were obtained by using organisms and medium directly from continuous culture. This procedure resulted in rates about 500 times greater than one in which harvested batch-grown cells were used. Growth could not be sustained below a threshold phosphate concentration of 3.4 nanomoles. Equations are presented for evaluation of growth rate-limiting substrate concentrations in the presence of background substrate and for evaluating low inhibitor concentration inhibition mechanisms by substrate prevention of inhibitor flux. (Little-Battelle)
W73-11574

PETROLEUM HYDROCARBONS AND FATTY ACIDS IN WASTEWATER EFFLUENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-11575

TOTAL MERCURY AND METHYLMERCURY CONTENT OF THE AMERICAN EEL (ANGUILLA ROSTRATA),
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 06C.
W73-11576

MERCURY, DDT, AND PCB IN HARBOUR SEALS (PHOCA VITULINA) FROM THE BAY OF FUNDY AND GULF OF MAINE,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-11577

THE SEASONAL CYCLE OF VITAMIN B12 IN THE STRAIT OF GEORGIA, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 02L.
W73-11578

RESIDUES OF CHLORINATED HYDROCARBON PESTICIDES IN THE NORTHERN QUAHOG (HARD-SHELL CLAM), MERCENARIA MERCENARIA-1968 AND 1969,
Rhode Island Dept. of Health, Providence. Div. of Labs.
For primary bibliographic entry see Field 05C.
W73-11579

DDT, DDE, AND POLYCHLORINATED BIPHENYLS IN BIOTA FROM THE GULF OF MEXICO AND CARIBBEAN SEA--1971,
Texas A and M Univ., College Station. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-11580

PRELIMINARY REPORT, (RV THOMAS G. THOMPSON CRUISE 66),
Washington Univ., Seattle. Dept. of Oceanography.
S. Campbell, T. Owens, and R. M. Millar.
Available from the National Technical Information Service as AD-754 843, Report Nos. PCR-66, Ref-M72-28, May 1972. 9 p, 1 fig, 9 ref. Project No. NR 083 012, Contract No. N-0014-67-A-0103-0014, Grant No. NSF-GA-24875.

Descriptors: *Dentrification, *Sea water, *Nitrates, *Chlorophyll, *Respiration, Nitrites, Nitrogen, Pacific Ocean, Water analysis, Zooplankton, Phytoplankton, Dissolved oxygen, Salinity, Phosphates, Ammonia, Sampling, Chemical analysis, Sediments, Methodology, Water pressure, Water temperature.
Identifiers: *Electron transport, Transport, RV Thomas G. Thompson, Organic nitrogen, Organic carbon.

Cruise 66 of the Thomas G. Thompson was the sixth in a series of cruises to the oxygen deficient waters of the eastern tropical North Pacific Ocean. The major objectives of the cruise were to: (1) Provide information on the variability of the transport of the products of denitrification out of the oxygen deficient region and determine the magnitude of the transport of these products by the California Undercurrent. (b) Provide nitrate and nitrite data from a number of areas where such information was previously unavailable. (c) Determine whether or not gaseous nitrogen is the main sink for the nitrate consumed during denitrification by the precise measurement of N/Ar and N-14/N-15 ratios, dissolved and particulate organic nitrogen, nitrate and nitrite. (d) Estimate respiration rates by obtaining profiles of the activity of the respiratory electron transport system both as a function of depth and latitude. (e) Determine the effects of pressure and temperature on the electron transport system, and (f) Obtain depth profiles of chlorophyll in plankton. The methods employed for the analyses are briefly described. However, no data are included. (Little-Battelle)
W73-11583

ANALYSIS OF SEA WATER BY DIFFERENCE CHROMATOGRAPHY. SUMMARY OF PROGRESS 1972,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
P. C. Mangelsdorf, Jr., and W. M. Chang.
Available from the National Technical Information Service as COO-3119-1, Report 1972. 27 p, 11 fig, 17 ref, 2 append. Contract No. AEC AT (11-1)-3119.

Descriptors: *Water analysis, *Connate water, *Ion exchange, Sulfates, Calcium, Sodium, Magnesium, Potassium, Carbonates, Chromatography, Sampling, Laboratory equipment, Atlantic Ocean, Salinity, Hydrogen ion concentration, Chlorides, Sea water.
Identifiers: *Difference chromatography, *Samples.

During the past year the principal new developments in work with Difference Chromatography have been: (1) Design and construction of a sturdier model of an in situ interstitial water sampler for collecting undisturbed pore water samples from marine sediments, (2) Successful use of this instrument at 24 locations across the North Atlantic on the Cork-Woods Hole leg of the R/V CHAIN cruise 105, (3) Discovery that the water samples collected in-situ are dramatically different from ordinary sea water and also different from what was expected, (4) Analysis of a suite of South Atlantic sea water samples taken with close vertical spacing, (5) Overhaul and reconstruction of two existing Difference Chromatographs to improve their reliability, (6) Design and construction of a new separate dual column Difference Chromatograph to permit further development work on anion analysis, resolution and sensitivity, etc., without interruption of the analytical program, (7) Further work on the reaction of fluvial sediments with sea water, probably resolving earlier discrepancies in the extent of ion exchange. (Little-Battelle)
W73-11584

MERCURY IN PUBLIC SEWER SYSTEMS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 05D.
W73-11585

NUTRIENT INVERSIONS IN THE SOUTHEASTERN TROPICAL PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02L.
W73-11587

MERCURY IN HARBOUR PORPOISES (PHOCOENA PHOCOENA) FROM THE BAY OF FUNDY REGION,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-11588

OXYGEN DEFICIENT CONDITIONS AND NITRATE REDUCTION IN THE EASTERN TROPICAL NORTH PACIFIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
J. D. Cline, and F. A. Richards.
Limnology and Oceanography, Vol 17, No 6, p 885-900, November 1972. 9 fig, 6 tab, 46 ref.

Descriptors: *Pacific Ocean, *Dissolved oxygen, *Nitrates, *Nitrites, *Reduction (Chemical), *Denitrification, *Cycling nutrients, *Deficient elements, Water analysis, Salinity, Water temperature, Phosphates, Ammonia, Silicates, Hydrogen ion concentration, Iron, Alkalinity, Carbon dioxide, Hydrogen sulfide, Sulfites, Chemical analysis, Gas chromatography, Distribution.
Identifiers: On board analysis, Nitrous oxide, Sulfites, Thiosulfate.

The purpose was to relate the distributions of dissolved oxygen and compounds of nitrogen and phosphorus in the oxygen-minimum zone of waters off Mexico and Central America to the effects of oxygen deficiencies on nitrate reduction, denitrification, and attendant microbiological processes occurring there. Chemical and physical observations included salinity, temperature, dissolved oxygen (Winkler and colorimetric), inorganic phosphate, nitrate, nitrite, nitrous oxide, ammonia, silicate, pH, alkalinity, total carbon dioxide, dissolved hydrogen sulfide, sulfite, thiosulfate, and soluble and particulate iron. On a second cruise, nitrate, nitrite, ammonia, phosphate, and silicate determinations were carried out on a Technicon AutoAnalyzer. Oxygen concentrations in the oxygen-minimum zone were commonly less than 1 microgram-atom/liter from below the pycnocline to depths of several hundred meters. In these nearly anoxic waters, nitrate appears to be reduced to nitrite and free nitrogen. Nitrate deficits, derived from material balance calculations, suggest that up to 13-14 microgram-atoms/liter (40-50 percent) of nitrate-nitrogen have been so reduced. Secondary nitrite concentrations rarely exceed 1.5 microgram-atoms/liter and are generally associated with oxygen concentrations of less than 2 microgram-atoms/liter. Ammonia concentrations appear to be slightly lower in the region of denitrification, probably because of bacterial assimilation. It is estimated that about 230 x 10 to the twelfth power grams of combined N are lost annually by denitrification. (Little-Battelle)
W73-11589

A NEW CRAYFISH OF THE SUBGENUS JUGICAMBARUS FROM TENNESSEE WITH AN EMENDED DEFINITION OF THE SUBGENUS (ASTACIDAE, DECAPODA),
Tennessee Univ., Knoxville. Dept. of Zoology and Entomology.
R. W. Bouchard.
The American Midland Naturalist, Vol 89, No 1, p 103-111, January 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Crustaceans, *Speciation, *Crayfish, Invertebrates, Tennessee, Ecology, Distribution, Color, Aquatic animals, Life cycles.

Identifiers: Jugicambarus, Macroinvertebrates, Decapods, Arthropods, Cambarus (Jugicambarus) crinipes, Cambarus crinipes.

Cambarus crinipes, a new species of crayfish from the Cumberland Plateau in Tennessee has been described. This new species belongs to the subgenus Jugicambarus which has been emended. Color notes, relationships, distribution, life history notes and ecological data are given. A more accurate method of measuring the carapace is proposed and the use of the posterior margin of the epistome as a possible taxonomic structure is introduced. (Holoman-Battelle)
W73-11590

ACUTE AND LONG-TERM ACCUMULATION OF COPPER BY THE BROWN BULLHEAD, ICTALURUS NEBULOSUS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05C.
W73-11593

BIOLOGICAL EFFECTS OF FLUCTUATING WATER LEVELS IN THE SNAKE RIVER, GRAND TETON NATIONAL PARK, WYOMING,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 02E.
W73-11594

PHYSICAL-CHEMICAL OCEANOGRAPHIC DATA FROM THE NORTH PACIFIC OCEAN AND BERING SEA, 1971,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. J. Ingraham, Jr., D. M. Fisk, C. J. Bartlett, and S. E. Turner.
Available from the National Technical Information Service as COM-73-10192. Data Report 75, February 1973. 172 p, 3 fig, 11 ref.

Descriptors: *Pacific Ocean, *Water temperature, *Depth, *Salinity, *Data processing, Water quality, Computers, Sea water, Density.
Identifiers: *Bering Sea, On board analysis, Sound velocity, RV George B. Kelez.

Temperature and salinity data were obtained in the North Pacific Ocean at 176 stations in 1971 during spring and autumn cruises of the RV George B. Kelez south of the Aleutian Islands, in the Bering Sea, and along the coasts of Washington and British Columbia. Values were obtained from STD traces at standard depths to 1,000m (spring data) or 1,500 m (autumn data). Computations of density (sigma-t), sound velocity, anomaly of specific volume, and dynamic height, which were performed by a shipboard PDP-8 computer, are presented. The autumn data tabulations were obtained automatically through a new computer interface. (Little-Battelle)
W73-11595

MEASUREMENT OF EXCHANGEABLE INORGANIC PHOSPHATE IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
W. C. Li, D. E. Armstrong, and R. F. Harris.
Environmental Science and Technology, Vol 7, No 5, p 454-456, May 1973. 2 tab, 22 ref.

Descriptors: *Phosphates, *Lake sediments, *Methodology, *Measurements, *Pollutant identification, Phosphorus, Phosphorus radioisotopes, Aquatic soils, Soil analysis, Chemical analysis, Nutrients, Radioactivity techniques, Sampling, Oxidation, Reduction (Chemical).
Identifiers: *Sediment-water equilibration systems, Lake Mendota (Wis), Lake Wingra (Wis), Lake Crystal (Wis), Lake Little John (Wis), Tomahawk Lake (Wis), Lake Trout (Wis), Devils Lake (Wis), Lake Minocqua (Wis).

The amounts of isotopically exchangeable inorganic phosphate in a range of Wisconsin lake sediments were measured in two contrasting (long- and short term) equilibration systems. The systems differed in equilibration times, oxidation reduction conditions, and the degree of agitation. Total sediment P was determined by Na2CO3 fusion, total organic P by the Mehta extraction procedure, and total inorganic P as the difference between total P and total inorganic P. Dissolved inorganic P in sediment extracts and in sediment-water equilibration systems was measured by the method of Murphy and Riley (1962). Levels of total exchangeable inorganic P were similar for the two systems, indicating that the simplified short-term equilibration method was suitable for routine measurements of exchangeable inorganic P. Differences between the two systems in the distribution of exchangeable P between the solid and solution phases were apparently related to differences in oxidation-reduction conditions. Exchangeable inorganic P ranged from 18-65 percent of the total inorganic P in the sediments investigated. (Holoman-Battelle)
W73-11596

EFFECT OF CHLORINE ON FLUORESCENT DYES,
California State Dept. of Public Health, Berkeley. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 05C.
W73-11597

A CYPRINODONTID FISH, JORDANELLA FLORIDAE, AS A LABORATORY ANIMAL FOR RAPID CHRONIC BIOASSAYS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05C.
W73-11598

A COLORIMETRIC TECHNIQUE SUGGESTED FOR CHEMICAL OXYGEN DEMAND DETERMINATION,
Jadavpur Univ., Calcutta (India). Dept. of Civil Engineering.
N. Chaudhuri, S. Niyogi, A. De, and A. Basu.
Journal Water Pollution Control Federation, Vol 45, No 3, p 537-541, March 1973. 4 fig, 3 tab, 8 ref.

Descriptors: *Chemical oxygen demand, *Methodology, *Colorimetry, *Laboratory tests, Chemical analysis, Waste water (Pollution), Industrial wastes, Domestic wastes, Chemical properties, Organic compounds, Estimating, Carbohydrates, Lipids, Proteins, Organic acids, Alcohols, Amino acids, Correlation analysis, Regression analysis, Volumetric analysis, Water properties.
Identifiers: *Substrates, Data interpretation, Correlation coefficients, Metabolites, Absorbance, Hilger pattern biochemical absorptiometer, Dextrose monohydrate, Organic solvents, L-glutamic acid, Absorption spectra, n-Butyric acid, Ethyl alcohol, O-Cresol, Alanine, Valine, Acetic acid, Toluene, Lactose, Sucrose, Tyrosine, Glycine, Lactic acid, Citric acid, Tartaric acid, Maleic acid, Oleic acid, Isopropyl alcohol, Benzene, Catechol, m-Cresol, Salicylic acid, Benzoic acid, Pyridine.

The feasibility and consistency of colorimetric estimation of chemical oxygen demand were investigated using a sufficiently large number of chemicals under varying test conditions. Chemicals representing carbohydrates, fats, proteins, and metabolites that are commonly encountered in domestic and industrial waste water were selected as test substances. A Hilger pattern biochemical absorptiometer (filter type) was used. The investigation revealed a very high degree of consistency between the colorimetric and chemical oxygen demand values, with a correlation coefficient of 0.99 or above in all tests. The method suggested for use consists of (a) selecting the optimum wave length, (b) determining the colorimetric absorbance on various substrates, and (c) preforming a linear regression to calibrate the technique. (Holoman-Battelle)
W73-11599

QUANTITATIVE INFRARED SPECTROPHOTOMETRY OF ORGANIC NITRATE ESTERS,
Picatinny Arsenal, Dover, N.J.
Y. P. Carignan, and C. L. Hickman, IV.
Available from the National Technical Information Service as AD-753938. Technical Report No. PA-TR-4350, May 1972. 71 p, 29 fig, 27 tab, 8 ref.

Descriptors: *Nitrates, Organic compounds, *Nitrogen compounds.
Identifiers: *Nitrate esters, *Infrared spectrophotometry, *Infrared spectra, *Organic nitrogen compounds, Ethyl nitrate, Amyl nitrate, Ethylene glycol dinitrate, Glycerol trinitrate, Cellulose nitrate, Absorbance, Organic solvents, Chloroform, Tetrahydrofuran, Quantitative analysis.

A quantitative infrared analysis of the N double bond O asymmetric stretching vibration band for the nitrate esters, ethyl nitrate, amyl nitrate, ethylene glycol dinitrate, glycerol trinitrate, and cellulose nitrate (12.53 percent) is presented. Two solvents, spectrograde chloroform and tetrahydrofuran, were used in the preparation of the solutions. For the five nitrate esters studied, Beer's law for the absorbance of the N double bond O asymmetric stretching band was found to be generally obeyed. From a measure of the absorbance one could calculate the amount of a given nitrate ester present in solution. The band shape for cellulose nitrate was significantly broader and consequently measurement of the absorbance at the band maximum was not a true indication of the absorption intensity. A more realistic measurement would be the integrated intensity of the band. (Holoman-Battelle)
W73-11600

MACROBENTHIC ECOLOGY OF A SAWDUST--BEARING SUBSTRATE IN THE PENOBSCOT RIVER ESTUARY (MAINE),
Maine Univ., Orono. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-11602

TRACE ANALYSIS BY ENZYME INHIBITION AND ACTIVATION,
Birmingham Univ. (England).
A. Townshend.
Process Biochemistry, Vol 8, No 3, p 22,24, March 1973. 1 fig, 3 tab, 40 ref.

Descriptors: *Enzymes, *Pollutant identification, *Inhibition, *Chlorinated hydrocarbon pesticides, *Heavy metals, Potassium, Calcium, Magnesium, Manganese, Zinc, Iron, Molybdenum, Copper, Cobalt, Fluorine, Mercury, Iodine, Sulfides, Beryllium, Lead, Aldrin, Heptachlor, DDT, Phosphothioate pesticides, Inhibitors.
Identifiers: *Drugs, Cyanides, Silver, Barium, Indium, Sevin, Lindane, Methyl parathion, Chlordane, Activation, Tetrahydrocannabinol, Morphine sulfate, Sodium phenobarbitone, Sensitivity, Sodium barbitone, Detection limits, Alcohol dehydrogenase, Alkaline phosphatase, Lipase, Invertase, Catalase, Hyaluronidase, Isocitrate dehydrogenase, Acid phosphates, LSD, Hexokinase, Carbonic anhydrase, Phosphatase, Dehydrogenase.

The use of enzyme inhibition and activation to detect metals, nonmetals, pesticides and drugs is reviewed. Activation techniques have been used to detect K, Ca, Mg, Mn, Zn, Fe, Mo, Cu, and Co. Inhibition methods have been used to detect F, Hg, Ag, I, sulfite, cyanide, Ba, Be, Zn, Cu, Fe, In, Rb, the pesticides aldrin, sevin, lindane, hep-

tachlor, methyl parathion, DDT, and chlordane, and the drugs LSD, tetrahydrocannabinol, morphine sulfate, sodium phenobarbitone, and sodium barbitone. Tables are included which show the enzymes used to detect metals, pesticides, and drugs and their detection limits. (Little-Battelle)
W73-11604

COPPER DETERMINATION IN WATER BY STANDARD ADDITION POTENTIOMETRY,
Missouri Univ., Columbia. Dept. of Chemistry.
M. J. Smith, and S. E. Manahan.
Analytical Chemistry, Vol 45, No 6, p 836-839, May 1973. 4 fig, 3 tab, 4 ref.

Descriptors: *Copper, *Potable water, *Water analysis, *Methodology, Chemical analysis, Heavy metals.
Identifiers: *Natural waters, *Standard addition potentiometry, *Trace levels, *Cupric ion electrode, Chemical recovery, Ion selective electrode, Copper electrodes, Complexing antioxidant buffer, Reagents.

Potentiometric techniques are described which are applicable to the analysis of tap water and natural waters for very low levels of copper. An Orion Model 94-29A solid-state cupric ion electrode was used in the analysis. Tap water samples were analyzed directly from the tap; natural water samples were first filtered, a complexing antioxidant buffer (CAB) was added, and the potential was allowed to equilibrate. The initial electrode potential and the potentials after each of 3 additions of standard Cu were recorded. The determination of copper in water samples using standard addition techniques with an ion selective electrode was facilitated through the use of CAB. With the method, copper in tap water has been determined at concentrations down to 9 ppb. Copper at a level of 9.0 ppb added to natural water samples containing between 3.3 and 46.8 ppb was analyzed with an average percent recovery of 102.9 percent and a relative standard deviation of 7.5 percent. Reagent purity is a major limiting factor in the analysis, and detailed directions are given for preparing the copper-free reagents required in the analysis. (Holoman-Battelle)
W73-11605

DETERMINATION OF NITROGEN, SULFUR, PHOSPHORUS, AND CARBON IN SOLID BIOLOGICAL MATERIALS VIA HYDROGENATION AND ELEMENT SELECTIVE DETECTION,
Oak Ridge National Lab., Tenn.
A. D. Horton, W. D. Shults, A. S. Meyer, and D. R. Matthews.
Environmental Science and Technology, Vol 7, No 5, p 449-451, May 1973. 1 fig, 4 tab, 4 ref.

Descriptors: *Nitrogen, *Sulfur, *Carbon, *Phosphorus, *Chemical analysis, *Methodology, Aqueous solutions, Hydrogenation, Chemical reactions, Nutrients, Seeds, Leaves, Plant tissues, Insects, Oligochaetes, Sodium sulfate, Copper sulfate.
Identifiers: *Biological materials, *Chemical composition, Sample preparation, Hydrides, Flame photometric gas chromatography, Precision, Electrolytic conductivity gas chromatography, Biological samples, Soil leachate, Millipedes, Spiders, Moths, Cicadas, Sulfuric acid, Phosphoric acid, Sodium nitrate, Potassium dihydrogen phosphate, Pyrolysis.

A rapid method for the simultaneous determination of nitrogen (N), sulfur (S), and carbon (C), and for the separate determination of phosphorus (P), in solid biological field specimens has been developed. No pretreatment of the samples other than freeze- or oven-drying and grinding to less than 40 mesh is required. Samples are weighed into quartz boats and introduced into a Dohrmann pyrolyzer that contains a platinum catalyst through which hydrogen flows and serves as both reactant and carrier. The elements N, S, P, and C are reduced to their respective hydrides. The effluent from the pyrolyzer is split: one portion passes to a flame photometric detector which responds to H2S, PH3, and CH4; the other portion passes to a Coulson electrolytic conductivity detector which responds to NH3. The average coefficient of variation for triplicate determinations of forest floor litter, the most common field specimen, is 1.4 percent for C, 5.8 percent for N, and 5.5 percent for S. Analysis time, exclusive of weighing and purging, is 6-8 minutes per sample with an 8-hr load of 25 samples, including the necessary standards. This system of pyrolysis and catalytic hydrogenation will reduce P, S, N, and C in inorganic compounds also. Water solutions of sodium sulfate, sulfuric acid, phosphoric acid, copper sulfate, sodium nitrate, and potassium dihydrogen phosphate were injected into boats and the water was allowed to evaporate before inserting the boat into the hot zone of the pyrolyzer. The response of the detector to the elements was approximately the same as that for equal amounts of the organically based elements. (Holoman-Battelle)
W73-11606

IMPROVED METHOD FOR CHARACTERIZING ENVIRONMENTAL HYDROCARBONS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass.
O. C. Zafiriou.
Analytical Chemistry, Vol 45, No 6, p 952-956, May 1973. 5 fig, 3 tab, 18 ref.

Descriptors: *Methodology, *Pollutant identification, *Water analysis, *Oily water, *Organic compounds, Gas chromatography, Separation techniques, Chemical analysis, Aging (Physical), Water pollution sources, Oil pollution, Variability.
Identifiers: *Flame ionization gas chromatography, *Petroleum products, *Crude oil, *Environmental samples, Precision, Reproducibility, Oil characterization, Sample preparation, Agha Jari crude oil, TJ It. crude oil, Oil fingerprinting, No. 2 fuel oil, Scot OV-101 columns, Chromatographic columns.

Routinely correlating environmental hydrocarbons from natural waters by gas chromatography requires optimal resolution and separation of weathering resistant components, operational simplicity, and good precision. Methods for comparing results from different columns must precede spectral libraries. A novel method of protecting columns from sample residues involves injecting solutions of oil rich samples into a capillary injection/splitter with disposable glass liner operated at 175C; reproducible results are obtained without sample cleanup. Temperature programmed OV-101 support-coated open tubular columns and FID detection yield excellent characterization. Characteristic signal intensity ratios have long-term relative standard deviations of 1.8-4 percent, 0.7 percent has been achieved short term. Ratios from three columns were similar enough for comparison directly or with a standard. The performance attained is adequate to correlate artificially weathered oils with sources and to differentiate most of thirty oils found in a major port. Extensions and improvements of the method are discussed. (Holoman-Battelle)
W73-11607

NEW PICOGRAM DETECTION SYSTEM BASED ON A MASS SPECTROMETER WITH AN EXTERNAL IONIZATION SOURCE AT ATMOSPHERIC PRESSURE,
Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research.
E. C. Horning, M. G. Horning, D. I. Carroll, I. Dzidic, and R. N. Stillwell.
Analytical Chemistry, Vol 45, No 6, p 936-943, May 1973. 9 fig, 1 tab, 13 ref.

Descriptors: *Pollutant identification, *Urine, Gas chromatography, Mass spectrometry, Digital computers, Laboratory equipment, Calibrations, Instrumentation.
Identifiers: *LC-mass spectrometry, *GC-mass spectrometry, *Detection limits, Cocaine, Methadone, Butabarbital, Pentobarbital, Phenobarbital, Secobarbital, 2 6 dimethyl-alpha-pyrone, Testosterone, Hydroxyphenobarbital, Dihydroxyphenobarbital, Drugs, Biological samples, Metabolites.

A novel mass spectrometer with an external ionization source can be used to detect picogram quantities of compounds of biological interest. The source contains a Ni-63 foil, and is at atmospheric pressure. Samples are introduced in a flowing gas stream in selected common solvents. Positive ions are formed by a complex series of ion molecule reactions. The ionization reaction for the sample may involve either proton transfer or charge transfer. Negative ions are formed by either resonance or dissociative capture of thermal electrons, or by ion-molecule interactions. In a favorable case (very little absorption on the reaction chamber walls), 5-10 picograms could be detected by single ion monitoring, and a scanned mass spectrum could be obtained with as little as 25 picograms. The potential uses include incorporation into LC-MS-COM and GC-MS-COM analytical systems. Cocaine, methadone, butabarbital, pentobarbital, phenobarbital, and secobarbital were analyzed in chloroform solvent, 2, 6, dimethyl-alpha-pyrone and testosterone were analyzed in benzene solvent, and phenobarbital, hydroxyphenobarbital, and dihydroxyphenobarbital were analyzed in rat urine extract. (Little-Battelle)
W73-11608

GAS CHROMATOGRAPH PEAKS IDENTIFIED ON-LINE BY A NEW GRATING INFRARED SPECTROPHOTOMETER,
Norcon Instruments, Inc., South Norwalk, Conn.
G. J. Penzias.
Analytical Chemistry, Vol 45, No 6, p 890-895, May 1973. 8 fig, 5 ref.

Descriptors: *Laboratory equipment, *Automation, *Organic compounds, *Pollutant identification, Solvents, Gas chromatography, Instrumentation, Alcohols.
Identifiers: *GC-Infrared spectroscopy, Methyl ethyl ketone, Toluene, n-Butanol, m-Xylene, o-Xylene, Methanol, Isoamyl acetate, p-Tolualdehyde, Aniline, Valeraldehyde, Ethanol, Methyl isobutyl ketone, Ketones, Organic solvents, Polystyrene, Infrared spectrophotometer, Detection limits, Acetone.

A new, double-beam ratio recording grating infrared spectrophotometer that scans from 2.5 to 15 micrometers in 6 seconds has been developed. It is designed to identify eluting gas chromatograph fractions on-line for routine analysis. Heated sample and reference cells are integral with the spectrophotometer, which utilizes a rapid-response, room-temperature detector. The new instrument was used to record infrared spectra of eluting GC fractions of various samples including coatings, paints, polymers, and other organic compounds (polystyrene film, phenolic epoxy solvent, methyl ethyl ketone, ethanol, methyl isobutyl ketone, toluene, n-butanol, m-xylene, o-xylene, acetone, methanol, isoamyl acetate, p-tolualdehyde, aniline, and valeraldehyde). Components of unresolved GC peaks were identified by scanning several spectra during the elution of a single peak. Fractions as small as 0.02 microliter were identified (e.g., a 1 percent component of a 2-microliter sample injected into the gas chromatograph). (Little-Battelle)
W73-11609

CHEMICAL OXYGEN DEMAND OF SOME NITROGENOUS HETEROCYCLIC COMPOUNDS,
Vysoka Skole Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
J. Chudoba, and J. Dalesicky.
Water Research, Vol 7, No 5, p 663-668, May 1973. 3 tab, 8 ref.

Descriptors: *Chemical oxygen demand, *Oxidation, *Chemical reactions, Nitrogen compounds, Nitrogen, Organic compounds, Ammonia, Chemical properties, Methodology.
Identifiers: *Heterocyclic hydrocarbons, *Organic nitrogen compounds, Pyridine, Nicotinic acid, Nicotinamide, Quinoline, Pyrrole, L-proline, Indole, D L-Tryptophan, Imidazole, L-histidine, Adenine, Uric acid, Uracil, Riboflavin, Isoalloxazine.

Chemical oxygen demands of fourteen nitrogenous compounds were determined by the dichromate method. Only pyridine and its derivatives were resistant to oxidation. Heterocyclic compounds containing one atom of nitrogen is a molecule, e.g. quinoline, pyrrole, proline, and indole were 90-100 percent oxidized. Nitrogen is split off these compounds as NH3. Heterocyclic compounds containing two or more atoms of nitrogen is a molecule are also easily oxidized. However, only a part of the nitrogen is split off as NH3. On the basis of the results obtained it is possible to make the following generalization: nitrogen in amino groups is split off mostly as NH3, quinoline, pyrrole, pyrrolidine, and indole nitrogen is split off as NH3; from imidazole and pyrimidine rings, one atom of nitrogen is pslit off as NH3 and one as N2; from the purine configuration, two atoms of nitrogen are split off as NH3 and two atoms as N2; from isoalloxazine, three atoms of nitrogen are split off as NH3 and one as N2. (Holoman-Battelle)
W73-11611

DISPERSED AND PARTICULATE PETROLEUM RESIDUES IN THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 05B.
W73-11612

SIMULATED DISTILLATION OF NARROW, HIGH BOILING HYDROCARBON FRACTIONS,
Chevron Research Co., Richmond, Calif.
T. H. Gouw.
Analytical Chemistry, Vol 45, No 6, p 987-989, May 1973. 2 fig, 1 tab, 5 ref.

Descriptors: *Distillation, Methodology, Gas chromatography, Chemical analysis, Organic compounds.
Identifiers: *Crude oil, *Graphical techniques, *Boiling point, *Petroleum fractions, Flame ionization gas chromatography, Thermal conductivity gas chromatography, Reproducibility, Petroleum distillation, Southern California crude oil.

A graphical technique has been used to obtain data on the average boiling point and the boiling range of narrow boiling hydrocarbon fractions for characterization purposes. The procedure was carried out in conjunction with a reasonably good gas chromatograph and a device for integrating peak areas. The technique was tested using cuts from the distillation of two Southern California crude oils. Simulated distillation was carried out using 2 Perkin-Elmer GC units equipped with flame ionization detectors and an Aerograph unit equipped with a thermal conductivity detector. Area integration was carried out with an optical integrator or a Disc integrator. The average standard deviations for the three temperatures used were considerably smaller than the deviations obtained by the ASTM simulated distillation method. The described method does not require equipment as sophisticated as what is necessary for regular simulated distillation. It appears to yield quite precise values for the average boiling point of narrow boiling, high molecular weight hydrocarbon fractions. The method is obviously also applicable to lower molecular weight fractions; in this case, it would probably be more appropriate to carry out a complete component analysis by gas chromatography. The described approach should not be regarded as a replacement or alternative technique to the ASTM D 2887-T method; it should be considered as a complementary method which is very useful in specific applications. (Holoman-Battelle)
W73-11613

PESTICIDES IN WATER,
Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-11618

GAS CHROMATOGRAPHIC AND MASS SPECTROMETRIC STUDIES OF S-ALKYL DERIVATIVES OF N,N-DIALKYL DITHIOCARBAMATES,
Uniroyal Ltd., Guelph (Ontario). Research Labs.
F. I. Onuska, and W. R. Boos.
Analytical Chemistry, Vol 45, No 6, p 967-971, May 1973. 5 fig, 2 tab, 8 ref.

Descriptors: *Pollutant identification, Herbicides, Pesticides, Chemical analysis, Separation techniques, Gas chromatography, Mass spectrometry, Organic compounds, Physical properties.
Identifiers: *GC-Mass spectrometry, *S-ethyl N N-dialkyl dithiocarbamates, *Flame ionization, Gas chromatography, *S-n-propyl N N-dialkyl dithiocarbamates, Retention time, S-n-propyl N N-dimethyl dithiocarbamate, Mass spectra, S-n-propyl N N-diethyl dithiocarbamate, S-n-propyl N N di-n-propyl dithiocarbamate, S-n-propyl N N-di-n-butyl dithiocarbamate, S-methyl N N-dialkyl dithiocarbamates.

Flame ionization gas chromatography and gas chromatography-mass spectrometry (GC-MS) have been used to separate mixtures by S-alkylated N, N-dialkyl dithiocarbamates. The gas chromatographic retention data are tabulated. A nonpolar liquid phase such as Apiezon L was quite suitable for separation. The mass spectral data obtained from the peaks eluted from the gas chromatographic column provided fragmentation patterns of the respective S-methyl DTC, S-ethyl DTC, or S-n-propyl DTC depending on the alkylating agent. These derivatives are easily separated by GC. The electron impact-induced fragmentation of the majority of DTC derivatives is consistent with bond rupture directed by the presence of bivalent sulfur in these molecules. It is very difficult to draw a simple decomposition path using tandem GC-MS because N,N-dialkyl dithiocarbamates are thermally very unstable. (Holoman-Battelle)
W73-11622

2,4,6-TRIPHENYLPYRYLIUM CHLORIDE. A NEW ORGANIC ANALYTICAL REAGENT FOR THE DETERMINATION OF CERTAIN ANIONS,
Consolidated Foods Corp., Santa Maria, Calif. Union Sugar Div.
T. C. Chadwick.
Analytical Chemistry, Vol 45, No 6, p 985-986, May 1973. 2 tab, 21 ref.

Descriptors: *Anions, *Chemical analysis, *Methodology, *Pollutant identification, *Gravimetric analysis, *Synthesis, Hydrogen ion concentration, Chemical precipitation, Chemical reactions, Cations, Zinc, Lead, Cadmium, Gold, Heavy metals, Boron, Sulfates, Fluorides, Bromides, Iron, Halides.
Identifiers: 2 4 6-Triphenylpyrylium, *Reagents, Perchlorates, Boric acid, Accuracy, Experimental error, Ionic interference, Chemical interference, Nitron chloride, Tetraphenylarsonium chloride, Tetraphenylphosphonium chloride, Tetraphenylstibonium chloride, Platinum, Tin, Iodates, Chlorates, Oxalates.

A simple synthesis of water-soluble 2,4,6-triphenylpyrylium chloride (TPC) has been devised and a study made of its behavior with a number of anions. Of two gravimetric procedures devised, the one which involves a determination of boric acid by conversion to tetrafluoroboric acid and subsequent precipitation has served to illustrate the utility of the new reagent, TPC. The other procedure involves a direct precipitation of perchlorate ion. TPC was found to give precipitates with iodide, thiocyanate, permanganate, dichromate, and ferrocyanide anions and also with the anionic chloro complexes of Zn (II), Sn (II), Pb (II), Cd (II), Pt (IV), and Au (III). Fluoride, bromide, iodate, chlorate, sulfate, and oxalate anions and the chloro complex of iron (III) failed to react with TPC under similar conditions. These experiments show that the reagent behaves very much like nitron and the tetraphenylarsonium, -phosphonium, and -stibonium chlorides. Perchlorate analyses were carried out using only a small (25 percent) excess of reagent to ensure complete precipitation. The precipitate was dried at 110C without any apparent decomposition. Boron analyses were performed using a modification of the procedure of Lucchesi and DeFord (1957). It was found necessary to use a 60 percent excess of TPC solution to ensure quantitative precipitation. Washing with a saturated, ice-cold, acidified (0.2N HC1) solution of 2,4,6-triphenylpyrylium tetrafluoroborate yielded satisfactory results in all cases. Care must be taken when working with TPC to see that all solutions are acidified because its hydrolysis is fairly rapid above pH 4. (Holoman-Battelle)
W73-11623

THE OCCURRENCE AND SEASONAL VARIATION OF TRACE METALS IN THE SCALLOPS PECTEN MAXIMUS (L.) AND CHLAMYS OPERCULARIS (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Lab.
G. W. Bryan.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 145-166, February 1973. 9 fig, 10 tab, 47 ref.

Descriptors: *Bioassay, *Aluminum, *Cadmium, *Chromium, *Cobalt, *Copper, *Iron, *Manganese, *Lead, *Nickel, *Zinc, Mollusks, Heavy metals, Absorption, Season.
Identifiers: *Silver, *Scallops, *Atomic absorption spectrophotometry, Pecten maximus, Sample preparation, Clam opercularis, Biological samples, Macroinvertebrates, Tissue juice, Gonads, Foot, Kidney, Tissue, Preconcentration, Bioaccumulation, English Channel, Body fluids.

Two species of scallops, Pecten maximus (L.) and Chlamys Opercularis (L.) were collected over a period of about 3 years from the English Channel in an attempt to follow seasonal changes in trace metal concentrations, to see whether reasons for individual variations could be detected, and to establish baseline concentrations for species from other areas. The body fluid, gonad, foot, kidneys, and remaining tissues from six animals were pooled for analysis of Ag, Cd, Cr, Co, Cu, Fe, Mn, Ni, Pb, and Zn by atomic absorption. Samples were prepared by drying, ashing, dissolving the ash in HC1, evaporating, and adding HC1 and distilled water. Since lead, nickel, and cobalt contents were low a concentration procedure was used which involved chelation with ammonium pyrrolidine dithiocarbamate and extraction into methyl isobutyl ketone. Although there was considerable variation between individual animals, the

mean concentrations of Ag, Co, Cr, Cu, Mn, Ni, Pb, and Zn were higher in the whole body of chlamys than in Pecten but concentrations of Al, Cd, and Fe were lower. In both species seasonal changes in the concentrations of Co, Cu, Fe, Mn, Ni, Pb, and Zn were observed and in general, the highest values were found in the autumn and winter months. These changes may be related to food supply, since concentrations were generally highest when phytoplankton productivity was low and tended to fall in the spring as productivity increased rapidly to its annual peak. Despite problems arising from individual and seasonal variation, the kidneys and digestive glands of scallops appear to have potential as biological indicators of trace metals. The results obtained for Pecten and Chlamys are compared with those in the literature for species from the family Pectinidae. (Little-Battelle)
W73-11624

THE ACCUMULATION FROM WATER OF ZN--65, MN-54, CO-58, AND FE-59 BY THE MUSSEL, MYTILUS EDULIS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 127-143, February 1973. 5 fig, 9 tab, 37 ref.

Descriptors: *Bioassay, *Mussels, *Zinc, *Manganese, *Iron, *Cobalt, Mathematical models, Sea water, Absorption, Radioactivity techniques, Heavy metals, Mollusks, Radioisotopes, Isotope studies, Stable isotopes, Model studies, Radiochemical analysis.
Identifiers: *Bioaccumulation, Zn-65, Mn-54, Fe-59, Co-58, Mytilus edulis, Macroinvertebrates, Biological samples, Foot, Mantle, Gonads, Adductor muscle, Stomach, Digestive gland, Gills, Tissue.

The accumulation from seawater of Zn-65, Mn-54, Fe-59, and Co-58 by the mussel, Mytilus edulis, has been studied in relation to the stable element levels of these isotopes both in the sea water and in individual tissues. For all four radionuclides the greatest accumulation occurred in the stomach and digestive gland samples and further localization of Zn-65 and Fe-59 was demonstrated by autoradiography. As the animals were starved during the accumulation period the loss of stable elements by individual tissues was also followed. Again the most notable effect occurred in the digestive gland tissues with the exception of a large loss of iron by the foot. Autoradiography showed that after two weeks accumulation, Fe-59 occurs in large clusters in the foot, notable in the byssus gland area. These clusters disappear after a further two-week period and may thus be secreted into new byssus threads. The accumulation of nuclides was examined using a single exponential model and values obtained for flux rates, biological half times and asymptotic values were compared with the stable element concentration factors. An analysis of parameters of exchange of nuclides in individual tissues with the water was further examined using the Kendall coefficient of concordance. There is an indication that as well as accumulating nuclides via particulate matter in suspension the mucus itself is capable of sequestering them, even though they are in the soluble form, and may even preferentially accumulate soluble forms. The actual role of water in the accumulation of the nuclides studied appears to be relatively minor compared with that of food accumulation as estimated by difference from the calculated stable element values. (Little-Battelle)
W73-11625

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO BUOY-BASED ENVIRONMENTAL DATA GATHERING,
National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
V. E. Derr, C. G. Little, C. B. Emmanuel, F. F. Hall, and P. A. Mandics.
Available from the National Technical Information Service as COM-73-10134. NOAA Technical Memorandum ERL WPL-7, September 1972. 148 p, 18 fig, 11 tab, 59 ref.

Descriptors: *Remote sensing, *Buoys, *Radar, *Meteorological data, *Oceans, *Surface waters, On-site data collections, Air environment, Methodology, Turbulence, Meteoric data, Air temperature, Thermocline, Currents (Water), Mixing, Oceanography, Rainfall intensity, Dissolved oxygen, Water temperature, Carbon dioxide, Chlorophyll, Aerosols, Sea water, Wind velocity.
Identifiers: *Lidar, *Radiometry, *Acoustic echo sounding, Marine environment, Method evaluation, Frequency modulated-continuous wave radar, Microwave radar, Pulsed doppler radar, Incoherent pulsed radar, Pseudorandom coded radar, Random noise radar, Coded radar, Microwave radiometry, Passive infrared radiometry.

The report is in response to a request by the National Data Buoy Project (NDBP) to evaluate possible remote sensing techniques for the interrogration of both the marine atmosphere and the ocean from buoys. The principal optical, radio, and acoustic remote sensing concepts relevant to ocean buoys are identified and discussed. The main body of the report discusses existing remote sensing concepts (acoustic echo sounding, radar, lidar, radiometry, and line-of-sight methods) and makes a preliminary evaluation of their potential applicability to the needs and objectives of the National Data Buoy Project. The environmental difficulties which a system may be expected to experience on the buoy are not treated in depth. Recommendations are presented which are directed toward the efficient exploration and realization of the potentials of the different remote sensing systems. (Holoman-Battelle)
W73-11631

TROPHICAL ROLE OF BACTERIA IN THE ECOSYSTEM OF THE CORAL REEF,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
Y. I. Sorokin.
Nature, Vol 242, No 5397, p 415-417, April 6, 1973. 3 fig, 2 tab, 13 ref.

Descriptors: *Biomass, *Bacteria, *Primary productivity, *Reefs, *Trophic level, Food chains, Organic matter, Phytoplankton, Benthic flora, Radioactivity techniques, Coral, Pacific Ocean, Sediments, Marine animals, Oysters, Gastropods, Annelids, Foods, Photosynthesis, Carbon dioxide.
Identifiers: Macroinvertebrates, Pocillopora damicornis, Pennaria tiarella, Serpullidae, Montipora verrucosa, Toxadocea violacea, Ascidia nigra, Ophiodesoma spectabilis, Nerita picea, Crassostrea gigas, Hydroids, Sponges, Tunicates.

Micorbial biomass at several atolls in the Pacific Ocean were determined by direct microscopy on stained membrane filters. Bacteria production and destruction, photosynthesis of phytoplankton and phytobenthos, and quantitative values of the feeding of aquatic animals on bacteria were determined using C-14. These results showed that biomass and production of bacteria were in the range of those for eutrophic or mesotrophic lakes. The rate of destruction of organic matter usually exceeded the rate of primary production in the surface layers of water and sediments. Bacteria cells made up 2-5 percent of the total organic matter of the reef sediments. The daily production of raw bacterial biomass in the reef sediments was about 5-15 g/sq m of bottom surface. The high rate of bacterial production may provide a significant part of the food of the fauna of the coral reefs. Experiments were also conducted in which corals were fed with bacterioplankton and seston labelled with C-14. The evolution of labelled metabolic CO2 by corals was used as a measure of the intensity of feeding and digestion of labelled bacteria. All the corals tested were able to feed on and digest the bacteria at concentrations close to that in the lagoon. The data show the importance of the bacteria population in the metabolism and productivity of the reef ecosystem. The internal function of the bacteria is nutrient regeneration and production of particulate protein food. The external function may be the consumption and assumption of external energy. (Little-Battelle)
W73-11632

SELECTIVE DETERMINATION OF COPPER (II) IN AQUEOUS MEDIA BY ENHANCEMENT OF FLASH-PHOTOLYTICALLY INITIATED RIBOFLAVIN CHEMILUMINESCENCE,
Tennessee Univ., Knoxville. Dept. of Chemistry.
E. L. Wehry, and A. W. Varnes.
Analytical Chemistry, Vol 45, No 6, p 848-851, May 1973. 4 fig, 4 tab, 17 ref.

Descriptors: *Copper, *Aqueous solutions, *Selectivity, *Pollutant identification, Chemical analysis, Heavy metals, Cations, Anions, Alkali metals, Alkaline earth metals, Methodology, Trace elements, Cobalt, Mercury, Hydrogen ion concentration, Oxygen, Chemical reactions, Photoactivation, Sodium, Calcium, Aluminum, Magnesium, Chromium, Manganese, Iron, Zinc, Nickel, Cadmium, Molybdenum, Flourides, Chlorides, Bromides, Nitrates, Sulfates, Nitrites, Ammonia, Bicarbonates, Water pollution.
Identifiers: *Chemiluminescence, *Riboflavin, *Flash photolysis, Detection limits, Organic solvents, Photochemistry, Chemical interference, Sensitivity, Complexing agents, Precision, Buffers, Silver, Ionic interference, Vanadium, Rhenium, Dioxane, Tetrahydrofuran, Acetone, Dimethyl sulfoxide, Acetonitrile, Dimethyl formamide, Methanol, Triethanolamine, Hydrogen peroxide, Perchlorates, Acetates, Sulfites, Cyanides, Thiocyanates, Iodates, Chlorates, EDTA, 1 10-Phenanthroline, 8-Hydroxyquinoline, Oxalates.

Copper (II) is determined in aqueous media (pH 6.0) by measuring its enhancement of riboflavin chemiluminescence in systems containing hydrogen peroxide and p-dioxane. The chemiluminescence is initiated by flash photolysis of the reaction system. The light source employed was a microsecond-duration xenon flashtube. Interfering ions are Co (II), Ag (I), Hg (I), and Hg (II); other common metal ions do not significantly interfere. The effects of other experimental parameters (anions, organic solvents, pH, buffer composition, initiating flash energy) are evaluated. The minimum detectable quantity of copper is 30 nanograms. The sensitivity and selectivity of light-and chemically-induced riboflavin chemiluminescence methods are compared; the light-induced system is concluded to be superior. The results suggest that flash photolysis, widely employed in mechanistic photochemistry, also has useful analytical potentialities. (Holoman-Battelle)
W73-11636

A QUANTITATIVE, SEMIROUTINE METHOD FOR DETERMINING ALGAL AND SEDIMENTARY CHLOROPHYLL DERIVATIVES,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
R. J. Daley, C. B. J. Gray, and S. R. Brown.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 345-356, March 1973. 4 fig, 6 tab, 44 ref.

Descriptors: *Algae, *Sediments, *Methodology, Separation techniques, Phytoplankton, Aquatic algae, Plant pigments, Marine algae, Plant tissues, Chemical analysis, Chlorophyll, Cyanophyta, Chrysophyta, Solvent extractions, Fluorometry, Chlorophyta, Diatoms, Distillation, Estimating, Spectrophotometry.
Identifiers: *Reverse-phase thin layer chromatography, *Chlorophyll derivatives, Sample prepara-

tion, Sensitivity, Reproducibility, Bacteriochlorophyll a, Pheophytin, Pheophorbide, Chlorophyllide a, Anacystis nidulans, Plectonema boryanum, Pediastrum boryanum, Scenedesmus quadricauda, Chlamydomonas reinhardi, Cylindrotheca closterium, Nitzschia, Porphyridium, Ochromonas, Lyophilization, Reflectance fluorometry, Ultrasonication.

An integrated quantitative method is described for the determination of chlorophylls and chlorophyll degradation products in freshwater phytoplankton and sediments. Prior to extraction, algal samples were concentrated by filtration through glass fiber filters while sediment samples were lyophilized. All materials were extracted in a mixture of acetone, methanol, and water (80:15:5) by ultrasonication in a glass extraction chamber refrigerated at -10 C. Extracts were filtered through solvent-resistent membrane filters, rather than centrifuged, and then fractionated without prior drying by reverse-phase thin-layer chromatography on oil-impregnated layers of kieselguhr G. Using three chromatographic systems consisting of different developing solvents and oil phases (triolein, parrafin oil, and castor oil), rapid, artefact-free separations of chlorophylls a, b, and c and 18 of their derivatives were obtained. Individual pigments were estimated by direct, in situ thin-layer scanning with a filter fluorometer. The sensitivity and reproductibility of the procedure are ca. 2 ng and 11 percent, respectively. In routine operation, the method is fast and relatively simple, a complete analysis being accomplished in 1.5 hr. (Holoman-Battelle)
W73-11637

IDENTIFICATION OF THE CONSTITUENTS OF KRAFT PULPING EFFLUENT THAT ARE TOXIC TO JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH),
British Columbia Research Council, Vancouver.
J. M. Leach, and A. N. Thakore.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 479-484, April 1973. 3 fig, 16 ref.

Descriptors: *Pollutant identification, *Effluents, *Pulp wastes, *Toxicity, *Juvenile fish, Chemical analysis, Salmon, Bioassay, Douglas fir trees, Hemlock trees, Distillation, Organic compounds, Methodology, Fibers (Plant), Industrial wastes, Gas chromatography, Organic acids, Separation techniques.
Identifiers: *Oncorhynchus kisutch, *Chemical composition, *Fatty acids, *Resin acid soaps, Flame ionization gas chromatography, Unbleached whitewater, GC-Mass spectrometry, Sample preparation, Thin layer chromatography, Sodium isopimarate, Sodium abietate, Sodium dehydroabietate, Palmitoleic acid, Oleic acid, Linoleic acid, Methyl isopimarate, Methyl abietate, Lauric acid, Myristic acid, Palmitic acid, Stearic acid, Arachidic acid, Behenic acid.

The nonvolatile constituents that are acutely toxic to juvenile coho salmon (Oncorhynchus kistuch) have been fully identified in a kraft pulping effluent derived from Douglas fir and western hemlock. Toxicity and material balances were maintained throughout a fractionation procedure leading to isolation of the toxic factors. Fractions were monitored by flame ionization gas chromatography and thin-layer chromatography. Individual compounds were identified initially by combination GC-mass spectrometry. Over 80 percent of the toxicity was caused by three resin acid soaps: sodium isopimarate (55 percent), sodium abietate (22 percent), and sodium dehydroabietate (5 percent). The remaining toxicity (18 percent) was contributed by sodium salts of the unsaturated fatty acids: palmitoleic, oleic, linoleic, and linolenic. (Holoman-Battelle)
W73-11638

PLANKTONIC CHANGES FOLLOWING THE RESTORATION OF LAKE TRUMEN, SWEDEN,
Lund Univ. (Sweden). Limnology Inst.
For primary bibliographic entry see Field 05G.
W73-11639

2,3-DIHYDROXYNAPHTHALENE AS INDICATOR FOR THE COMPLEXOMETRIC TITRATION OF IRON (III) WITH EDTA,
Hans Raj Coll. Delhi (India).
G. S. Manku.
Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 335, March 6, 1973.

Descriptors: *Heavy metals, *Iron, *Chelation, *Methodology, Cations, Volumetric analysis, Chemical analysis, Anions, Alkali metals, Alkaline earth metals, Strontium, Chemical reactions, Pollutant identification, Bromides, Fluorides, Zinc, Cadmium, Calcium, Strontium, Manganese, Magnesium, Beryllium, Aluminum, Titanium, Phosphates, Iodides, Halides, Nickel, Copper.
Identifiers: *2 3-Dihydroxynaphthalene, *Complexometric titration, *EDTA, *Chemical indicators, Chemical interference, Complexation, Metal chelates, Borates, Tartrates, Citrates, Barium, Antimony, Bismuth, Zirconium, Thiosulfates, Cyanides, Vanadium, Oxalates, Sulfocyanides, Vanadates, Molybdates, Tungstates, Uranyl.

2,3-Dihydroxynaphthalene has been used as a metal indicator for the complexometric titration of Fe (III) with EDTA. The pH of the acidic Fe (III) solution (0.1-67 mg) was adjusted to about 2 with ammonia, and 1M HCl-sodium acetate buffer (pH 5) and 0.5 percent w/v ethanolic 2,3-dihydroxynaphthalene were then added. The resulting solution was diluted with distilled water and titrated against a 0.010-0.050 M EDTA solution until a sharp color change from purple to colorless was observed. The relative standard deviation for the procedure was 0.8-1.5 percent. Cyanide, sulfocyanide, oxalate, Ni (II), V (IV), Vanadate, Molybdate, tungstate, uranyl and Cu (II) ions were found to seriously interfere with the procedure. No interference was caused by these ions: bromide, borate, tartrate, citrate, fluoride, Zn, Cd, Ca, Ba, Sr, Mn (II), Mg, and Be. Given amounts of the following ions could be tolerated in relation to a known quantity of Fe (III): Al, Sb, Bi, Co, Zr, Ti, phosphate, thiosulfate, and iodide. (Holoman-Battelle)
W73-11641

A SOLVENT EXTRACTION METHOD FOR THE DETERMINATION OF PHOSPHORUS-32 IN SEA WATER,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
W. W. Flynn, and W. R. Meehan.
Analytica Chimica Acta, Vol 63, No 2, p 483-488, February 1973. 5 tab, 7 ref.

Descriptors: *Sea water, *Separation techniques, Water analysis, *Phosphorus, Radioactivity techniques, Aluminum, Aqueous solutions, Water, Calcium, Cobalt, Chromium, Copper, Iron, Mercury, Magnesium, Manganese, Nickel, Lead, Zinc, Nitrates, Sulfates, Molybdenum, Sodium, Radioisotopes, Nuclear reactors, Radioactive wastes.
Identifiers: *Scintillation counting, *P-32, *Chemical recovery, *Chemical interference, Sample preparation, Storage, Ac-228, As-76, Ba-133, Bi-207, Ca-45, Ce-144, Co-60, I-131, Mn-54, Mo-99, Na-22, Silver, Arsenic, Bismuth, Cesium, Fluorine, Iodine, Lanthanum, Columbium, Rubidium, Antimony, Silicon, Strontium, Tin, Tellurium, Thorium, Uranium, Yttrium, Zirconium, Acetates, Ascorbic acid, Borates, Oxalates, Tartaric acid, Barium, Actinium, Cerium.

Seawater samples to be analyzed for Phosphorus-32 were collected in polyethylene bottles and treated with perchloric acid. The perchloric acid treatment converts all phosphorus to orthophosphate. The procedure involved adding a phosphorus carrier (potassium dihydrogenphosphate), and extracting P-32 as the phosphomolybdate from a solution of 0.66 M sulfuric acid with isobutyl acetate. A buffered ammonium solution stripped the carrier from the solvent and a precipitate (as magnesium ammonium phosphate) was used for counting. This method was unsatisfactory with demineralized water, but substitution of isoanyl alcohol gave 90-95 percent recovery of the carrier from solutions as high as 0.7 N in acid. Results were similar with seawater. Recoveries of phosphorus ranged from 16 percent to 100.8 percent. Addition of interfering ions Ag, Al, As, Bi, Ca, Co, Cr (3 plus), Cs, Cu (2 plus), Fe (3 plus), F, Hg, I, La, Mg, Mn, Nb, Ni, Pb, Rb, Sb, Si, Sr, Sn, Te, Th, U, Y, Zn, Zr, acetate, ascorbic acid, borate, citrate, nitrate, oxalate, sulfate, and tartaric acid did not affect recovery. Study of radionuclides (Ac-228, As-76, Ba-133, Bi-207, Ca-45, Ce-144, Co-60, I-131, Mn-54, Mo-99, and Na-22) showed decontamination factors in excess of 1000 for most. The recovery of P-32 from samples of seawater spiked with a standard solution and stored for six weeks in polyethylene bottles under various conditions showed that the method was quantitative. (Little-Battelle)
W73-11643

MULTI-ELEMENT NEUTRON ACTIVATION ANALYSIS OF SEDIMENT USING A CALIFORNIUM-252 SOURCE,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
D. W. Hayes, and S. F. Peterson.
Available from the National Technical Information Service as DP-MS-72-38, Report September 11, 1972. 4 p, 4 fig, 2 tab, 2 ref. Contract No. AEC-AT (07-2)-1.

Descriptors: *Bottom sediments, *Cores, *Neutron activation analysis, *Radioactivity techniques, *Chemical analysis, Heavy metals, Alkali metals, Alkaline earth metals, Halogens, Pollutant identification, Aquatic soils, Atlantic Ocean, Soil analysis, Manganese, Aluminum, Calcium, Sodium, Chlorine, Magnesium, Titanium, Bromine, Oceans, Irradiation.
Identifiers: *Multielemental analysis, *Californium-252, Rare earth elements, Vanadium, Dysprosium, Californium radioisotopes.

The application of a Cf-252 source to the neutron activation analysis of several elements in small (approximately 1.5 inch in diameter) cores was studied using high-resolution gamma ray spectroscopy and manual data reduction. A preliminary study of 4-inch segments of various ocean bottom cores by this method showed that Mn, Al, Ca, Na, Cl, and V were easily detected. Other elements found in some of the samples were Mg, Ti, Br, Dy, Ca, and I. Cores from the Atlantic Ocean were analyzed for the easily detectable elements, and on the basis of elemental content, were characterized as pelagic clay or pure sand. With a few modifications, the procedure could be used aboard a ship or on shore to obtain rapid elemental analysis of sediment cores using a Cf-252 source, Ge (Li) detector, multichannel analyzer, and manual data reduction. The procedure could also be used to analyze sediment cores from estuaries or tidal flats. The procedure could be improved by using a 4096 analyzer, and computerized data reduction, and by rotating the core during activation and counting. Procedures are discussed for eliminating interference and differences in irradiation and counting between standards and samples. (Holoman-Battelle)
W73-11644

INFLUENCE OF LEAD AND OTHER METALS ON FISH DELTA-AMINOLEVULINATE DEHYDRASE ACTIVITY,
National Marine Water Quality Lab., West Kingston, R. I.

E. Jackim.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 560-562, April 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Bioassay, *Inhibition, *Heavy metals, *Enzymes, Copper, Cadmium, Lead, Zinc, Silver, Toxicity, Marine fish.
Identifiers: *Sample preparation, *Mummichogs, *Winter flounder, Aminolevulinate acid dehydrase, Biological samples, Fundulus heteroclitus, Pseudopleuronectes americanus.

Mummichogs (Fundulus heterocitus) and winter flounder (Pseudopleuronectes americanus) were exposed to solutions of Cu, Cd, Pb, Zn, and Ag salts for periods of 96 hours and 2 weeks to study the effects of lead and other metals on delta-aminolevulinate acid dehydrase activity (ALA-D). ALA-D activity was determined by homogenizing the organs in KCl, adding phosphate buffer and ALA-D. After one hour, reactions were stopped by the addition of HgCO2 and trichloroacetic acid. This solution was centrifuged, the supernatant treated with Erlichs reagent and glacial acetic acid and allowed to react, and optical density determined as a measure of enzyme activity. Lead decreased ALA-D activity in both acute and chronic exposures in fish. The inhibition was not unique to lead, but appears to be limited to a few toxic heavy metals, namely lead, mercury, and copper. Other metals (Zinc, silver, and cadmium) increased enzyme activity at least during early periods of exposure or low concentrations. The results of the tests are expected to provide an index of response to heavy metals in estuarine waters. (Little-Battelle)
W73-11646

A CENTRIFUGE METHOD FOR DETERMINING LIVE WEIGHTS OF AQUATIC INSECT LARVAE, WITH A NOTE ON WEIGHT LOSS IN PRESERVATIVE,
Colorado State Univ., Fort Collins. Dept. of Zoology.
J. A. Stanford.
Ecology, Vol 54, No 2, p 449-451, Early Spring 1973. 4 fig, 5 ref.

Descriptors: *Aquatic insects, *Larvae, *Methodology, Larval growth stage, Weight, Diptera, Caddisflies, Stoneflies.
Identifiers: *Weight loss, *Live weights, *Sample preservation, Reproducibility, Data interpretation, Pteronarcys californica, Hydropschye occidentalis, Brachycentrus, Atherix variegata, Ethyl alcohol.

A reproducible centrifuge drying method for determining live or preserved weights of aquatic insects is described. Live or preserved larvae are transferred into centrifuge tubes with forceps, or they may be filtered from the preservative by pouring the sample through a tube. The tubes are inserted into the shields of the centrifuge head; the larvae are spun for 3 min at 650 rpm. Weights are computed by subtracting the weight of the empty centrifuge tube from the weight of the tube plus insects after spinning. Care must be taken, however, to keep water from the outside of the tube since it does not spin off. An attempt was made to derive a conversion factor for weight loss in preservative. Results showed a great interspecific variation in weight loss over a period of time due to the effect of preservative. (Holoman-Battelle)
W73-11647

THE HEAVY METAL CONTENT OF RAINFALL IN THE EAST MIDLANDS,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
E. G. Hallsworth, and W. A. Adams.
Environmental Pollution, Vol 4, No 3, p 231-235, April 1973. 2 tab, 2 ref.

Descriptors: *Heavy metals, *Rainfall, *Chemical analysis, *Water analysis, *Air pollution effects, *Fly ash, *Pollutant identification, Water pollution, Fog, Colorimetry, Copper, Cobalt, Lead, Molybdenum, Calcium, Aluminum, Magnesium, Titanium, Iron, Manganese, Chromium, Nickel, Zinc, Boron.
Identifiers: Optical spectroscopy, Vanadium, Silicon.

Analyses of rainfall were made between March 1973 and March 1964 to determine whether irregularities in the growth of clover plants at the University of Nottingham were due to contamination by fly-ash from power stations in the area. In order to test this, a series of small polyethylene funnels were set up and the rainwater was collected in polyethylene bottles which were emptied at monthly intervals or more frequently depending upon rainfall intensity. The rainwater was washed out of the bottles with distilled water, evaporated to dryness, the weight of dry matter obtained, and ashed before analysis. Cu and Co were determined colorimetrically, and other constituents by optical spectography. The disparity recorded between rainfall and contamination and the apparent dependence of the latter on seasonal factors, such as fog, suggested that the major contribution to the input was not airborne soil. The differing heavy metal content of the fly-ash and rainfall ash from the various sources was discussed, the copper and molybdenum content being considerably higher at certain sites than at others. An unusually high level of lead was noted. (Holoman-Battelle)
W73-11648

SMALL-SCALE EXPERIMENTS TO DETERMINE THE EFFECTS OF CRUDE OIL FILMS ON GAS EXCHANGE OVER THE CORAL BACK-REEF AT HERON ISLAND,
For primary bibliographic entry see Field 05C.
W73-11650

SUBLETHAL EFFECTS OF BALTIMORE HARBOR WATER ON THE WHITE PERCH, MORONE AMERICANA, AND THE HOGCHOKER, TRINECTES MACULATUS,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 05C.
W73-11652

A SIMPLE MICROSCALE VACUUM COLLECTOR FOR THE ELUTION OF CLOSELY SITUATED SPOTS FROM THIN-LAYER CHROMATOGRAMS,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Vancouver Lab.
J. Y. Cheng.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 460-461, March 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Reliability, Laboratory equipment, Plant pigments, Laboratory tests, Marine algae, Separation techniques, Sampling.
Identifiers: *Thin layer chromatography, *Microscale vacuum collector, *Elution, Chemical recovery, Chlorophyll a, Chlorophyll c, alpha-Carotene, Canthaxanthin, Diatoxanthin, Fucoxanthin, Peridinin, Lutein, Seaxanthin, Chroomonas salina, Isochrysis galbana, Cryptomonads.

A 'homemade' device, utilizing disposable Pasteur pipettes and a side-armed test tube, is described for convenient quantitative removal and elution of closely separated spots from thin-layer chromatograms. Its simplicity of manipulation and 'disposability' after use offer an excellent economic and timesaving elution technique for routine handling of numerous samples. (Holoman-Battelle)
W73-11657

A COMPARISON OF BENTHIC MICROALGAL PRODUCTION MEASURED BY C-14 AND OXYGEN METHODS,
Copenhagen Univ., Hillerod (Denmark). Freshwater Biological Lab.
C. Hunding, and B. T. Hargrave.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 309-312, February 1973. 1 tab, 15 ref.

Descriptors: *Primary productivity, *Radioactivity techniques, *Benthic flora, *Algae, *Carbon, *Absorption, *Dissolved oxygen, Photosynthesis, Methodology.
Identifiers: Sensitivity, C-14, Errors.

A comparison of estimates of benthic primary production on a sandy beach measured by in situ oxygen and laboratory C-14 methods showed that both methods gave similar measures of the magnitude of production. Sources of error in each method are discussed. Measures of C-14 uptake offer sensitivity when production is low, but when undisturbed sediment cores can be obtained, production is most easily measured by following changes in dissolved oxygen. (Little-Battelle)
W73-11658

AN IMPROVED EKMAN-TYPE GRAB,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
W. Burton, and J. F. Flannagan.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 287-290, February 1973. 2 fig, 1 tab, 4 ref.

Descriptors: *Sampling, *Design, *Reliability, Mechanical equipment, Benthos, Statistical methods.
Identifiers: *Grab sampler, *Ekman grab sampler.

An improved Ekman-type grab with top lids, which are locked open during descent and weighted to keep them closed during retrieval, is described. In comparative trials with a Wildco Tall 6-inch Birge-Ekman, the new grab collected significantly more chironomids and oligochaetes, and about the same number of the heavier and larger animals such as gastropods, sphaeriids, trichopterans, etc. The new design also improves the versatility and mechanical reliability of the grab. (Little-Battelle)
W73-11659

SAMPLING PROCEDURES AND PROBLEMS IN DETERMINING PESTICIDE RESIDUES IN THE HYDROLOGIC ENVIRONMENT,
Geological Survey, Arlington, Va.
H. R. Feltz, and J. K. Culbertson.
Pesticides Monitoring Journal, Vol 6, No 3, p 171-178, December 1972. 8 fig, 1 tab, 18 ref.

Descriptors: *Aquatic environment, *Pesticide residues, *Methodology, *Equipment, *Sampling, Pollutant identification, Water sampling, Fluvial sediments, Data collections, Bottom sediments, DDT, DDE, DDD, Chlorinated hydrocarbon pesticides, Monitoring, Variability.
Identifiers: Data interpretation, Sample preservation, Depth-integrating sampler, Suspended-sediment samplers, Bed-material sampler, Sampling frequency.

Diligent use of standardized sampling and analytical techniques is essential to meaningful assessments of the occurrence, distribution and fate of pesticide residues in the hydrologic environment. The validity of analytical data and subsequent interpretations are interdependent and limited to the confidence level of adequate, representative sampling of various components. Equally important are appropriate sample-preservation practices and procedures for sample preparation and cleanup and identification, measurement, and confirmation of residues. Analytical schedules should include pesticides listed in the Revised Chemicals

Monitoring Guide for the National Pesticide Monitoring Program and should be responsive to special interests. Samplers are available for collecting acceptable water, fluvial material, and bottom-material samples in about 75 percent of the river miles and in lakes and estuaries throughout the United States; however, more experience is needed in sampling hydrosols and low intensity deposits at the active water-sediment interface. (Holoman-Battelle)
W73-11660

BOD: DETERMINING THE NECESSARY DILUTION TECHNIQUE,
Uniroyal, Inc., Naugatuck, Conn. Pollution Abatement Control.
J. A. Brown, Jr., J. Paul, L. C. Rice, and J. M. Lines.
Water and Sewage Works, Vol 120, No 5, p 105, May 1973. 4 ref.

Descriptors: *Methodology, *Biochemical oxygen demand, *Mathematical studies, *Measurements, Water quality, Water pollution effects, Equations, Chemical oxygen demand.
Identifiers: *Dilution technique, Sample size, Accuracy.

A method is presented whereby the dilutions necessary for the BOD test are calculated mathematically with the virtual elimination of trial and error methods outlined in 'Standard Methods'. With the simple calculations presented and by utilizing a few logical assumptions, the BOD sample size can be adequately calculated. In the Industrial Pollution Abatement Laboratory which performs BOD's at a rate of about 1200 a year this method has been an improvement over the trial and error method of determining dilution volumes. The number of tests that have to be repeated because of improper dilution has been greatly reduced. (Holoman-Battelle)
W73-11661

POLAROGRAPHIC METHOD FOR NITRATE AND DISSOLVED OXYGEN ANALYSES,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
C. P. Hwang, and C. R. Forsberg.
Water and Sewage Works, Vol 120, No 4, p 71-74, April 1973. 1 fig, 4 tab, 5 ref.

Descriptors: *Nitrates, *Dissolved oxygen, *Polarographic analysis, *Methodology, *Pollutant identification, Chemical analysis, Water analysis, Industrial wastes, Waste water (Pollution).
Identifiers: Phenoldisulfonic method, Iodometric method, Accuracy, Precision.

A polarographic apparatus with a rapid dropping electrode was investigated as a potentially better method to determine nitrate and dissolved oxygen. Nitrate was found to produce well-defined waves of d-c curves in region of -1.25 v, however, the recommended measurement of nitrate is at -1.40 v. It takes only seven minutes (five minutes for deaerating, one minute for reading, and one minute for using the calibration curve) compared to five hours for the phenoldisulfonic acid method. The precision of the polarography method and the phenoldisulfonic acid method is plus or minus 0.27 mg/l and plus or minus 0.22 mg/l. Results using the polarograph method and the azide modification of the iodometric method in the determination of dissolved oxygen in BOD tests show that the polarographic method mostly yields the higher values. The azide modification requires 30 minutes to get results, the polarographic method requires only 2 minutes and, in contrast, can measure DO in the range found in water, wastewater, and industrial wastes. This method is not subject to the usual interferences; its precision in 0.1 N KCl solution is plus or minus 0.075 mg/l. (Holoman-Battelle)
W73-11662

IMPROVED DOUBLE DETECTION GAS CHROMATOGRAPH-MASS SPECTROMETER INTERFACE FOR THE ANALYSIS OF COMPLEX ORGANIC MIXTURES,
Rome Univ. (Italy). Istituto di Chimica Analitica.
F. Bruner, P. Ciccioli, and S. Zelli.
Analytical Chemistry, Vol 45, No 6, p 1002-1006, May 1973. 5 fig, 1 tab, 5 ref.

Descriptors: *Organic compounds, *Instrumentation, Chemical analysis, Laboratory equipment, Research equipment, Gas chromatography, Mass spectrometry.
Identifiers: *GC-Mass spectrometry, *Mixtures.

The results are reported that were obtained by modifying an AEI MS 12 mass spectrometer for better gas chromatography - mass spectrometry operation. The changes introduced in the gas lines have been the following: Elimination of every metal part except the three-way connection at the end of the column, and substitution of the metal capillary with a glass rod (0.5-mm i.d., 5-mm o.d.) to connect the column to the separator. The part of the chromatograph usually employed for the inlet splitter of capillary columns injection is used to make the connection with the mass spectrometer. In this way the injection port, FID, and the first part of the line connecting the GC to the MS are placed very close to each other and heated at the same temperature using the original heating system given by the manufacturer. With the modified apparatus, it is possible to eliminate the Total Ion Monitor (TIM) recording of the chromatogram using for this scope FID trace. By working with the repetitive scanning device operating continuously during the chromatogram and watching the output of the mass spectrometer on an oscilloscope, one has only to check the intensity of the spectrum, and when it reaches the right value, push the button to record the spectrum of a given chromatographic peak on the UV light oscillograph to get it displayed on paper. The results show also that many defects of coupling MS and GC, attributed to the separator, are actually dependent on the inefficiency of the gas lines of the interface. (Holoman-Battelle)
W73-11663

LIQUID-LIQUID EXTRACTION OF CADMIUM WITH HIGH-MOLECULAR-WEIGHT AMINES FROM IODIDE SOLUTIONS,
Oak Ridge National Lab., Tenn.
C. W. McDonald, and F. L. Moore.
Analytical Chemistry, Vol 45, No 6, p 983-985, May 1973. 5 tab, 7 ref.

Descriptors: *Separation techniques, *Mercury, *Cadmium, *Aqueous solutions, Radioactivity techniques, Heavy metals, Hydrogen ion concentration, Solvent extractions.
Identifiers: *Amines, Chemical recovery, Stripping, Cadmium iodide, Primene JM-T, Primene 81-R, Amberlite LA-1, Alamine 336-S, Aliquat 336-S.

The extraction behavior of cadmium from acidic and alkaline aqueous iodide solutions was studied using four classes of high-molecular-weight amines. The amines investigated were Primene JM-T, Primene 81-R, Amberlite LA-1 (N-dodecenyltrialkylmethylamine), Alamine 336-S (tricaprylamine), and Aliquat 336-S (tricaprylmethylammonium chloride). These were dissolved in xylene and converted to iodide salts. Preliminary tests were conducted with aqueous solutions containing Cd-109 labelled cadmium chloride. With acid solutions, all amines except Primene JM-T extracted quantitatively. With alkaline solutions, only Aliquat 336-S extracted quantitatively with Primene 81-R showing very high extractability. Aliquat 336-S, therefore, was used in additional studies to determine the effect of pH, HI concentration, and concentration of extractant on cadmium extraction. Ammonium hydroxide, 5 percent ethylenediamine, and 0.1 M cysteine-1 M sodium hydroxide, each proved to be excellent extractants of cadmium from the Aliquat 336-S-I-xylene solutions. Further studies with solutions containing cadmium and mercury and extracted with Aliquat 336-S-I-xylene showed that the mercury and cadmium could be separated by stripping the cadmium with ammonium hydroxide or ethylenediamine and then stripping the mercury with alkaline cysteine. (Little-Battelle)
W73-11664

5B. Sources of Pollution

DIRECT DETERMINATION OF THE ELECTROMAGNETIC REFLECTION PROPERTIES OF SMOOTH BRACKISH WATER TO THE CONTINUOUS SPECTRUM FROM 100 MILLION TO 4 BILLION HERTZ,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 02L.
W73-11052

POLLUTION AS A RESULT OF FISH CULTURAL ACTIVITIES,
Utah State Div. of Wildlife Resources, Salt Lake City.
R. N. Hinshaw.
Copy available from GPO Sup Doc as EP1.23:73-009,, $2.60; microfiche from NTIS as PB-221 376, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-009, February 1973. 209 p, 5 fig, 1 tab, 13 ref. EPA Project 18050 EDH.

Descriptors: Water pollution, *Fish hatcheries, Fish, Water quality, Public health, Fish management, Water quality standards, Outfall, Water pollution sources, *Benthic fauna.
Identifiers: *Trout hatchery, Pollution evaluation, Receiving waters, *Fish cultural activities, Water quality criteria, *Fish hatchery discharges.

Fish hatchery activities have been suspected as a source of pollution. This study was undertaken to evaluate hatchery discharges in relationship to possible pollution. A program of semi-monthly physical-chemical analysis was conducted for a year at six trout hatcheries. These determinations were taken at the hatchery inflow and outfall, the receiving water above and below the hatchery outfall. Bottom fauna was sampled once a month during the summer and bi-monthly through the winter on selected stations in the receiving waters. Flow data was recorded for the influent, effluent, and receiving waters. There was no correlation between the pounds of food fed in the hatcheries and: (1) changes of chemical quality in the receiving waters; (2) changes in kinds and numbers of bottom fauna organisms in the receiving waters. The analysis of samples revealed degradation of the water quality through every hatchery and in the receiving water. This degradation was beneficial from a fisheries standpoint but water quality and public health considerations may require cleanup before acceptable levels could be achieved. (EPA)
W73-11077

STATE-OF-THE-ART REVIEW OF PULP AND PAPER WASTE TREATMENT,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11080

AN INVENTORY OF SUSPENDED SEDIMENT STATIONS AND TYPE OF DATA ANALYSIS FOR PENNSYLVANIA STREAMS, 1947-70,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 02J.
W73-11083

TRITIUM CONCENTRATION OF A VARIETY OF WATER SAMPLES: FIFTH LISTING,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
M. W. Hughes, and J. C. Dighton.
Available from NTIS, Springfield, Va. 22151 NP-19391 Price $3.00 printed copy; 95 cents microfiche. Technical Memorandum No 4, 1972. 6 p, 8 tab.

Descriptors: *Tritium, *Water pollution sources, *Chemical analysis, *Surface waters, *Groundwater, Data collections, Rain water, Pastures, Forests, Australia, Radioisotopes, Path of Pollutants.

This memorandum presents a further listing of tritium concentrations determined by the method described by Hughes and Holmes in C.S.I.R.O., Division of Soils, Technical Paper 3, 1970. These samples were anlyzed during the period 2/22/71 to 8/25/71 and the 133 samples reported brings the total of tritium analyses in this laboratory to 628. All results have an estimated standard deviation of 7% or 0.3 T.U. whichever is the larger. The tables of data include: tritium concentration of Hawthorn (Adelaide) rainfall; rain water samples from Cape Northumberland (South Australia); samples taken from the top of the water table at a selection of pasture and forest sites in the southeast of South Australia; samples taken from beneath the water table from installed tubes at Padthaway and Mt. Gambier; tritium concentration of water obtained by burning wheat and wine samples in oxygen; tritium concentration of a variety of underground water samples from the southeast of South Australia; tritium concentration of a variety of surface samples from the southeast of South Australia; and tritium content of a subsurface water sample from Tasmania. (Woodard-USGS)
W73-11104

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY : APPENDIX H, MINERALS.
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-11107

CHARACTERISTICS AND ENVIRONMENTAL QUALITY OF SIX NORTH SHORE BAYS, NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK,
State Univ. of New York, Stony Brook. Marine Science Research Center.
For primary bibliographic entry see Field 02K.
W73-11108

SURVEY OF WATER QUALITY AND SEDIMENTS IN SIX NORTH SHORE BAYS, NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK (APPENDIX TO TECHNICAL REPORT NO. 14),
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 02K.
W73-11109

LEAF PROCESSING IN A WOODLAND TROUT STREAM,
Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.
R. C. Petersen, K. W. Cummins, and F. O. Howard.
Report TD-COO-2002-14, 1972. 36 p, 4 fig, 10 tab, 45 ref. AEC Contract AT (11-1-2002.

Descriptors: *Decomposing organic matter, *Leaves, *Leaching, *Surface waters, Degradation (Decomposition), Systematics, Laboratory tests, On-site investigations, Streams, Testing procedures, Evaluation, Correlation analysis, Classification, Water pollution sources.
Identifiers: Leaf decay rate, Decay coefficients.

The 24-hour leaching experiments of leaf material in streams and subsequent daily monitoring for additional effects, show that the dominant leaching effect is within the first 24 hours. Using techniques of Riggs (1970) a log-normal plot of leaf decay shows two distinct decay functions with a decided break at 24 hours. This result appears in the natural stream or in laboratory experiments using glass beakers to conduct the leaching. Comparing a 6-day experiment with measurements every day, with data for up to 143 days, does not show any additional severe break. The calculated leaching decay coefficients are presented for the seven main species along with the percentage lost per day. The leaching coefficient is expressed on a daily basis as are all the decay coefficients. (Woodard-USGS)
W73-11112

WATER QUALITY INVESTIGATIONS: SOURIS RIVER BASIN, NORTH DAKOTA, 1969,
Environmental Protection Agency, Kansas City, Mo. Region VII.
B. Hegg.
Available from NTIS, Springfield, Va. 22151 as PB-214 072, Price $3.00 printed copy; $0.95 microfiche. Report, February 1971. 65 p, 5 fig, 23 tab, 10 ref, append.

Descriptors: *Water quality, *Chemical analysis, *Water analysis, *Streams, *North Dakota, Water properties, Nutrients, Water pollution sources, Physical properties, International waters, Canada, International law, Municipal wastes, Industrial wastes, River basins, Water pollution effects.
Identifiers: *Souris River basin (N. Dak).

A water quality investigation was carried out during the summer and fall of 1969 to provide information on basic water quality conditions in the Souris River basin, North Dakota, and to define sources of water quality degradation. Physical, chemical, bacteriological, and biological parameters were evaluated at a number of locations throughout the United States portion of the basin. Water quality conditions reflected a river system which was basically eutrophic. Nutrient concentrations, especially phosphorus, were adequate to support intense algal blooms. Water quality was degraded by untreated municipal waste discharges at the North Dakota communities of Kenmare, Velva, and Towner and by the industrial waste discharge from Winger Cheese Company at Towner. All of these waste dischargers presently provide secondary treatment. Other sources of nutrients, oxygen-demanding materials, and other pollutants which degrade water quality were found in runoff from unused land, agricultural runoff including animal feedlot drainage, irrigation return flows, urban runoff, decaying vegetation in shallow impoundments, and large flocks of migrating waterfowl. The distribution and use of Souris River water is controlled by various water rights and several International agreements. Water supply is inadequate to provide for all desired uses, and conflicts exist over priority of water use. (Woodard-USGS)
W73-11115

PHOSPHATE IN INTERSTITIAL WATERS OF ANOXIC SEDIMENTS: OXIDATION EFFECTS DURING SAMPLING PROCEDURE,
John Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
J. T. Bray, O. P. Bricker, and B. N. Troup.
Science, Vol 180, No 4093, p 1362-1364, June 29, 1973. 2 fig, 14 ref. AEC Contract AT (11-1)-3292.

Descriptors: *Phosphates, *Bottom sediments, *Chesapeake Bay, *Pore water, Water pollution sources, Oxidation, Sampling, Iron, Eutrophication, Path of pollutants.

Oxidation during sampling procedures significantly decreases the inorganic phosphate concentrations of interstitial water rich in iron (II). All sampling and analytical procedures must be carried out in an inert atmosphere. Orthophosphate in interstitial water of sediments, in equilibrium with vivianite, may be a nutrient source for the overlying water. This is a potential cause of eutrophication in Chesapeake Bay. (Knapp-USGS)
W73-11118

ECOLOGY OF YELLOWSTONE THERMAL EFFLUENT SYSTEMS: INTERSECTS OF BLUE--GREEN ALGAE, GRAZING FLIES (PARACOENIA, EPHYDRIDAE) AND WATER MITES (PARTNUNIELIA, HYDRACHNELLAE),
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-11131

BIOLOGICAL OXIDATION OF THE HYDROCARBONS IN AQUEOUS PHASE,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
D. L. Liu, and B. J. Dutka.
Journal Water Pollution Control Federation, Vol 45, No 2, p 232-239, February 1973. 12 fig, 1 tab, 9 ref.

Descriptors: *Microbial degradation, *Oil wastes, *Oxidation, *Gas chromatography, Pseudomonas, Oily water, Enzymes, Oxygen demand, Waste treatment.
Identifiers: *Pseudomonas desmolytica, *Decane, Culture media, Metabolites, Biological oxidation, Sample preparation.

Biological oxidation of hydrocarbons in aqueous phase by Pseudomonas desmolytica was studied by manometric and gas chromatographic techniques. The organisms were grown on media containing n-decane and Indulin C in a cyclone fermenter for 20 hours before the harvesting of the cells. Cell-free extracts were prepared by centrifugation and chemical treatment. Overall oxygen consumption as determined in a differential respirometer was taken as a measure of enzyme activity. Oxidation products were identified using a chromatography equipped for flame ionization detection. Cell free extracts prepared from cells grown on n-decane plus the thiolignin Indulin-C were more active in oxidation of n-decane than were corresponding cells grown on n-decane alone. The hydrocarbon-oxidizing enzyme was most active at pH 7 and could be precipitated by 30 percent ammonium sulfate. Manometric and gas chromatographic studies indicated that the initial oxidate attack occurred at the terminal methyl carbon and required both oxygen and nicotinamide adenine dinucleotide. These studies suggest that Indulin-C or other nontoxic surfactant may be used to accelerate biological treatment of petroleum waste water. (Little-Battelle)
W73-11132

WATER QUALITY MODELS FOR TOTAL COLIFORM,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
R. P. Canale, R. L. Patterson, J. J. Gannon, and W. F. Powers.
Journal Water Pollution Control Federation, Vol 45, No 2, p 325-335, February 1973. 10 fig, 10 ref.

Descriptors: *Coliforms, *Water quality, Model studies, *Turbidity, *Temporal distribution, Environmental effects, Seasonal, Water temperature, Kinetics, Enteric bacteria, Mathematical models, Michigan, Least squares method, Water pollution sources, Water pollution, Beaches, Lakes, Ecological distribution, *Lake Michigan, Mortality, Statistical models.
Identifiers: *Grand Traverse Bay, Survival, Boardman River, Species density, Autoregression, Deterministic models.

First-order kinetic formulations approximated the death curve of total coliform bacteria following an initial growth period in experiments where domestic waste water was added to Lake Michigan water. Three separate studies using water collected during different seasons have demonstrated that the first-order rate coefficient is temperature dependent and relatively independent of illumination, prechlorination, and season of the year. The rate coefficient exhibits a linear variation with temperature. The seasonal changes in total coliform density in the bay, as measured at the Traverse City municipal water intake, can be approximated using weighted sine and cosine series, auto-regression, and multiple-regression statistical models. Although it is possible to obtain a satisfactory fit of the data with each of these approaches, such models cannot be reliably used for long-range predictions. Historical data collected in Grand Traverse Bay demonstrate regular seasonal variations as well as long-range trends for total coliform density and turbidity. Additional data convey a consistent spatial pattern of total coliform at beaches in near-shore regions of the bay. These data and data from more recent surveys along with circulation patterns predicted from modeling studies suggest that a deterministic approach based on continuity equations may be possible. (Holoman-Battelle)
W73-11135

OXIDATION OF COPPER (II) SELENIDE BY THIOBACILLUS FERROOXIDANS,
Department of Natural Resources, Quebec. Mineral Research Center.
For primary bibliographic entry see Field 05C.
W73-11171

ORGANIC MATERIALS IN THE MARINE ENVIRONMENT AND THE ASSOCIATED METALLIC ELEMENTS,
Bhabha Atomic Research Centre, Bombay (India).
T.N.V. Pillai, M. V. M. Desai, E. Mathew, S. Ganapathy, and A. K. Ganguly.
Current Science, Vol 40, No 4, p 75-81, Feb 20, 1971. 1 fig, 8 tab, 25 ref.

Descriptors: *Trace elements, *Sea water, *Solubility, *Organic matter, Chemistry, Analytical techniques, Chemical analysis, Sediments, Distribution, Zinc, Manganese, Cobalt, Cesium, Potassium, Calcium, Strontium, Aluminum, Iron, Copper, Barium, Sorption, Marine algae, Marine geology.

Dissolved organic matter obtained from an algal culture grown in a marine medium was found to solubilize trace elements. The rate at which the solubilized elements change their ionic properties with the growth of the culture and the relative abundance of cationic, anionic, and non-ionic species of these elements were studied at elemental concentrations up to 500 micrograms/liter. The sorption of Zn, Mn, and Co by a sample of coastal marine sediment was observed to be many times higher than by the same sediment freed of organic matter, whereas sorption of alkali and alkaline earth elements such as Cs, K, Ca, and Sr showed no significant difference. Trace element analysis showed that humus materials showed high contents of trivalent elements such as Al and Fe, and of bivalent elements such as Cu and Zn. Studies on the interaction of humic acid with added solutions of trace elements show that alkali and alkaline earth elements, such as Sr, Ba, Ra, exist in exchangeable cationic; transition elements, such as Zn, Mn, Cu, and Co, exist in cationic and non-cationic; while trivalentand heavy elements exist mostly in non-cationic forms in the humic acid. (Jerome-Vanderbilt)
W73-11184

METABOLISM OF TRITIATED WATER IN THE DAIRY COW,
California Univ., Livermore. Lawrence Livermore Lab.
G. D. Potter, G. M. Vattuone, and D. R. McIntyre.
Health Phys. Vol 22, No 4, p 405-409, 1972. Illus.
Identifiers: *Cows (Dairy), Meat, *Metabolism, Milk, Nuclear technology, *Tritiated water, Radionuclides.

The transfer of manmade radionuclides through the cow-milk and cow-meat-man pathways was studied. In view of the fact that tritium is a by-product of reactiors, nuclear testing, natural gas stimulation by nuclear explosives and other nuclear technologies, it is of interest to study the metabolism of this nuclide in the form of tritiated water in the dairy cow following oral administration. The present work includes the study of organically bound tritium as well as unbound tritiated water in the milk, blood, urine and feces of the Holstein dairy cow.--Copyright 1973, Biological Abstracts, Inc.
W73-11186

PHENYLMERCURIC ACETATE: METABOLIC CONVERSION BY MICROORGANISMS,
Wisconsin Univ., Madison. Dept. of Entomology.
F. Matsumura, Y. Gotoh, and G. M. Boush.
Science, Vol 173, No 3991, p 49-51, 2 July 1971. 3 fig, 11 ref.

Descriptors: *Chromatographic analysis, *Radiochemical analysis, *Mercury, *Organic compounds, *Microorganisms, Biochemistry, Water pollution, Soil pollution, Laboratory tests, Inorganic compounds, Distribution, Metabolism, Aquatic animals.

The extent to which mercury-containing compounds contribute to the formation of methylmercury derivatives, which are known to cause neurological damage, is discussed. An attempt was made in laboratory tests to study the metabolic fate of phenylmercuric acetate in soil and aquatic organisms, and to investigate the significance of the action of microorganisms on the fate of mercury residues. Labelled 203 Hg phenylmercuric acetate was used in analysis of the distribution of radioactivity between the supernatant and the sediment after incubation in a culture medium. The major portion of the mercury residue in the supernatant was bound to organic matter present in either the soluble protein fraction or the amino acid fraction. Almost all of the mercury residues in the microbial incubation products exist either as a form bound to organic matter or as a solvent-extractable organic mercury compound. The amount of inorganic mercury produced is likely to be extremely small. One of the major metabolic products was diphenylmercury. In none of the cases has a methylmercury derivative been found among the microbial metabolic products of phenylmercuric acetate. (Jerome - Vanderbilt)
W73-11187

COMPOSITION OF AIRBORNE LEAD PARTICLES,
Ethyl Corp. Research Labs., Ferndale, Mich.
For primary bibliographic entry see Field 05A.
W73-11188

GEOLOGY AND GROUND-WATER CHARACTERISTICS OF THE HANFORD RESERVATION OF THE U.S. ATOMIC ENERGY COMMISSION, WASHINGTON,
Geological Survey, Washington, D.C.
R. C. Newcomb, J. R. Strand, and F. J. Frank.
Geological Survey Professional Paper 717, 1972. 78 p, 11 fig, 3 plate, 3 tab, 50 ref.

Descriptors: *Nuclear powerplants, *Radioactive waste disposal, *Water pollution effects, *Hydrogeology, *Water quality, Environmental effects, Groundwater, Aquifers, Surface waters, Geochemistry, Geology, Water wells, Water level fluctuations, Hydrologic data, Artificial recharge.
Identifiers: *U.S. Atomic Energy Commission, *Hanford Reservation (Wash).

Investigations were made to obtain general information on the geologic and hydrologic situations that control many of the operations on the Hanford Reservation of the Atomic Energy Commission. Important aspects were the conditions that govern disposal of radioactive waste to the geologic environment, the general geologic conditions at the plant site, and the availability of groundwater for various industrial and domestic water supplies. The work consisted of geologic mapping of the reservation, determining the composition and interrelations of the stratigraphic units, and deriving the characteristics of the groundwater. After the start of the work in 1950, a second project, involving mostly drilling and sampling work around disposal sites, was undertaken and carried on after the completion of the original project in 1953. The drilling was continued until 1958; some of the data obtained in that work are included. Disposal of radioactive materials beneath the low terraces along the Columbia River has created some potential hazards, should the river become diverted and cut new channels through such disposal sites. (Woodard-USGS)
W73-11204

EFFECT OF SOIL, COVER, SLOPE, AND RAINFALL FACTORS ON SOIL AND PHOSPHORUS MOVEMENT UNDER SIMULATED RAINFALL CONDITIONS,
Ohio State Univ., Columbus. Dept. of Agronomy.
D. A. Munn, E. O. McLean, A. Ramirez, and T. J. Logan.
Soil Science Society of America Proceedings, Vol 37, No 3, p 428-431, May-June 1973. 1 fig, 7 tab, 14 ref.

Descriptors: *Leaching, *Soil erosion, *Phosphates, *Nutrient removal, Phosphorus, Infiltration, Percolation, Runoff, Rainfall intensity, Water chemistry, Soil chemistry, Eutrophication.

Removal of phosphorus was studied in three soils treated with phosphorus at 25, 125, and 625 micrograms per gram of soil in bare and cropped microplots and subjected to simulated rainfall. The quantity of runoff water, eroded solids, and P in the runoff increased with degree of slope and rainfall intensity. A high correlation ($r \pm 0.997$) was found between total P in the runoff from the bare plots and the quantity of soil eroded. Concentrations of soluble P in runoff from the plots was sufficient to eutrophy empounded water. The soil was nearly saturated with water and the system was closed so that runoff and leachate from a given rain were inversely related. Hence, the plant cover which was very effective in reducing runoff volume and soil erosion (as well as P losses) increased the quantity of percolating water. The increased percolation of water increased the P leached from cropped plots having uniformly mixed P. Dominant P fractions and their increases with rate of P application were directly related to extractable Fe and Al content, pH, and percentage base saturation of the original soils. There was no significant change in the amount of P in organic form with rate of P application. (Knapp-USGS)
W73-11208

PHOSPHORUS LOSSES FROM FOUR AGRICULTURAL WATERSHEDS ON MISSOURI VALLEY LOESS,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
G. E. Schuman, R. G. Spomer, and R. F. Piest.
Soil Science Society of America Proceedings, Vol 37, No 3, p 424-427, May-June 1973. 6 tab, 15 ref.

Descriptors: *Phosphates, *Soil erosion, *Water pollution sources, *Path of pollutants, Adsorption, Sediment yield, Sheet erosion, Suspended load, Erosion control, Loess, *Iowa.

Phosphorus losses from four field-size experimental watersheds at Treynor, Iowa, were measured during 1969-71. A contour-planted corn watershed and a pasture watershed were fertilized at the recommended P rate (39 kg/ha). A level-terraced and a second contour-planted corn watershed were fertilized at 2.5 times this rate. At the high level of P fertilization, phosphorus loss by surface runoff from the contour-planted corn watershed was 0.495 kg/ha in 1969, 1.034 kg/ha in 1970, and 2.130 kg/ha in 1971. Level terraces greatly reduced P loss by reducing runoff and erosion. Water samples for all runoff events taken above the overfall of each watershed gully contained considerably more inorganic P in solution than samples taken at the weir site, 70 to 230 m downstream. This reduction in solution P was caused by the adsorption of P by the additional suspended soil material entering the stream from gully erosion. (Knapp-USGS)
W73-11209

SIMULTANEOUS TRANSPORT OF CHLORIDE AND WATER DURING INFILTRATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02K.
W73-11213

INDUSTRIAL WASTE SURVEY, DADE COUNTY, FLORIDA.
Federal Water Quality Administration, Fort Lauderdale, Fla. Lower Florida Esturary Study.

Available from NTIS, Springfield, Va. 22151 as PB-213 299, Price $3.00 printed copy; $0.95 in microfiche. Environmental Protection Agency, Athens, Georgia, Southeast Water Laboratory Technical Report TS03-71-208-03.1, September 1971. 76 p, 10 fig, 5 tab, 5 append.

Descriptors: *Water pollution sources, *Industrial wastes, *Surface waters, *Florida, Sampling, Water analysis, Chemical analysis, Water pollution control, Biochemical oxygen demand, Chemical wastes, Pulp wastes, Canneries, Flood processing industry, Thermal pollution, Oil wastes, Coliforms, Toxins.
Identifiers: *Dade County (Fla).

Studies of industrial pollution of surface waters in Dade County, Florida, reveal that: (1) twenty-one industries discharge to groundwater by various means and 15 discharge to surface waters; (2) industrial wastes are contaminating the inland waters of Dade County by the addition of oxygen demanding materials, petroleum derivatives, coliform bacteria and toxic substances; (3) industries sampled contribute over half of the BOD load discharged into inland Dade County waters; (4) many industries discharge cooling waters mixed with process waste waters; (5) to meet treatment requirements established by the Dade County Board of Commissioners, pretreatment will be required at most industries; (6) in-plant changes, recycling, and improved housekeeping techniques would substantially reduce waste discharges at many industries; (7) inadequately disinfected discharges from 11 food processing and paper mill industries present a health hazard; and (8) of the 15 industries discharging to surface waters, those discharging to navigable waters are in violation of the 1899 Refuse Act. (Woodard-USGS)
W73-11217

LITHIUM IN SURFICIAL MATERIALS OF THE CONTERMINOUS UNITED STATES AND PARTIAL DATA ON CADMIUM,
Geological Survey, Washington, D.C.
H. T. Shacklette, J. G. Boerngen, J. P. Cahill, and R. L. Rahill.
Circular 673, Washington, D.C., 1973. 8 p, 2 fig, 2 tab, 20 ref.

Descriptors: *Metals, *Cadmium, *Soils, *Analytical techniques, *Geochemistry, Chemical analysis, Geologic surveys, Statistical methods, Distribution patterns, United States, Pollutant identification.
Identifiers: *Lithium, *Surficial materials, Atomic absorption spectroscopy.

Concentrations of lithium in 912 samples of soils and other regoliths from sites approximately 50 miles apart throughout the United States are represented on a map by symbols showing the five ranges of values. A histogram of the lithium concentrations is also given. The geometric mean lithium concentration is 20.4 ppm (parts per million) for all samples, 17.3 ppm for samples from the Eastern United States, and 23.3 ppm for samples from the Western United States. Cadmium concentrations were less than 1 ppm in all but 11 of the 912 samples. Ten of these 11 samples contained from 1 to 1.5 ppm cadmium; one sample contained 10 ppm cadmium. (Oleszkiewicz-Vanderbilt)
W73-11268

THE LEAD INDUSTRY AS A SOURCE OF TRACE METALS IN THE ENVIRONMENT,
Missouri Univ., Rolla. Dept. of Civil Engineering; and Missouri Univ., Rolla. Environmental Health Research Center.
B. G. Wixson, E. Bolter, N. L. Gale, J. C. Jennett, and K. Purushothaman.
Paper presented at the Environmental Resources Conference on Cycling and Control of Metals, BaHelle Memorial Institute, Columbus, Ohio, October 31-November 2, 1972. 22 p, 7 fig, 16 ref.

Descriptors: *Mining, *Industrial wastes, *Heavy metals, *Missouri, Trace elements, Zinc, Copper, Cadmium, Effluents, Dusts, Fallout, Air pollution, Water pollution, Bacteria, Algae, Sampling, Streams, Vegetation, Evaluation, Environmental effects.
Identifiers: *Mining wastes.

Mining, milling, transportation and smelting of lead ore in the Viburnum Trend area of Southeastern Missouri are discussed with emphasis placed on pollution introduced into the environment during each of these processes. During the mining and milling processes it is possible for lead and other trace metals to enter the environment from mine water, from dust particles resulting from the grinding process and from the tailing dams at settling ponds. Lead concentrations exceeded 0.1 ppm 42 times during a year-long survey of stream water. The benthic flora associated with nutrient trapping and recycling were seen as exellent filters for ore particles. Along transportation routes elevated levels of trace elements were found up to 100 feet from the roadway. Open trucks and railroad cars contribute to wind-blown trace metals in the environment. Smelting operations introduce lead, zinc, copper and cadmium particulate matter into the air. Areas around smelting plants were monitored and fallout decreased with increased distance from the stack. (See also W73-11270) (Jerome-Vanderbilt)
W73-11269

AN INVESTIGATION OF ENVIRONMENTAL POLLUTION BY LEAD AND OTHER HEAVY METALS FROM INDUSTRIAL DEVELOPMENT IN SOUTHEASTERN MISSOURI,
Missouri Univ., Rolla. Dept. of Civil Engineering; and Missouri Univ., Rolla. Environmental Health Research Center.
B. G. Wixson, and W. H. Tranter.
Paper presented at the 1972 National Telecommunications Conference, Houston, Texas, December 4-6, 1972. 5 p, 1 fig, 11 ref.

Descriptors: *Wastes, *Mining, *Heavy metals, *Lead, *Remote sensing, Engineering, Environmental engineering, Air pollution, Soil contamination, Water pollution, Copper, Cadmium, Zinc, Path of pollutants, Data collection, Evaluation, Sampling, Instrumentation, Vegetation, *Missouri.

Air, soil, and water investigations of environmental pollution are underway in the New Lead Belt of Southeastern Missouri. Planned future investigations are discussed with emphasis on applications of remote sensing to monitor the environment. Mining and smelting operation wastes contain the trace elements lead, copper, zinc, cadmium and other metals which may be harmful to the ecosystem. Preliminary results indicate that the air environment is the primary medium through which particulates containing lead and other trace metals reach various receptors in soil, plants and water. These particulates do not carry far from the source. Soil samples from the New Lead Belt area were found to have higher metal concentrations than background levels, and these concentrations were greater near smelting facilities and along roadways and railroads. Dissolved concentrations found in streams in the area were relatively low. Remote sensing by photographic techniques allows data collection over a large area with relative ease. The primary remote sensing tool has been color and infrared photography. Soil and vegetation seem to be the primary sinks for heavy metals in the ecosystem. (See also W73-11269) (Jerome-Vanderbilt)
W73-11270

ENVIRONMENTAL IMPACT OF TRACE METALS ON THE NEW LEAD BELT OF S.E. MISSOURI,
Missouri Univ., Rolla. Dept. of Civil Engineering; and Missouri Univ., Rolla. Environmental Health Research Center.
For primary bibliographic entry see Field 05C.
W73-11271

TRANSFER OF METALLIC MERCURY INTO THE FOETUS,
Rochester Univ. Medical Center, N.Y.
M. R. Greenwood, T. W. Clarkson, and L. Magos.
Experientia, Vol 28, No 10, p 1455-1456, 1972. 1 tab, 3 ref.

Descriptors: *Mercury, *Animal pathology, *Laboratory tests, Metals, Heavy metals, Pathology, Blood, Path of pollutants, Toxicity.
Identifiers: *Foetus, Clinical studies, Rats.

Wistar rats were exposed to radioactive mercury vapor for 2 1/2 minutes, another group of animals was exposed to labelled mercuric chloride through i.v. injection. The data demonstrate that the amount of mercury in the blood was over 25 times greater in animals injected with ionic mercury than in vapor exposed rats. This difference is probably due to the fact that metallic mercury rapidly diffuses from blood to tissues as reported previously. Despite this difference in blood levels the total amount of mercury taken up by the placental-foetal unit was approximately the same. However, in animals exposed to the radioactive vapor nearly half of the mercury taken up by the placental-foetal unit was found in the foetus compared with 1% in the group injected with inorganic Hg. (Oleszkiewicz - Vanderbilt)
W73-11274

LEAD CONTAMINATION OF SNOW,
Ministry of the Environment, Ottawa (Ontario). Water Management.
N. LaBarre, J. B. Milne, and B. G. Oliver.
Water Research, Vol 7, 1973. 4 p, 1 tab, 21 ref.

Descriptors: *Lead, *Snow, *Air pollution, *Water pollution, Gasoline, Sediments, Precipitation, Runoff, Surface waters, Analytical techniques, Sampling, Heavy metals, Path of pollutants.

Identifiers: Automobile exhaust, Leaded gasoline.

Snow from disposal sites and along roads contained considerable lead due to the combustion of leaded gasolines by automobiles. In spite of lead concentrations up to 4330 ppm in the sample particulate, the highest concentration in samples melted and filtered through Whatman No. 1 filter paper was 0.21 ppm with the average, 0.04 ppm. Thus, the dumping of snow away from water-courses instead of directly into them significantly reduces lead contamination of the waters from this source. (Oleszkiewicz-Vanderbilt)
W73-11275

DIURNAL VARIATION OF AEROSOL TRACE ELEMENT CONCENTRATIONS IN LIVERMORE, CALIFORNIA,
California Univ., Livermore. Lawrence Radiation Lab.
K. Rahn, J. J. Wesolowski, W. John, and H. R. Ralston.
Journal of the Air Pollution Control Association, Vol 21, No 7, p 406-409, July 1971. 1 fig, 1 tab, 6 ref.

Descriptors: *Trace elements, *Metals, *Distribution patterns, *Aerosols, *California, Air pollution, Mercury, Cadmium, Nickel, Lead, Alkali metals, Heavy metals, Sampling, Neutron activation analysis, Path of pollutants, Pollutant identification.
Identifiers: Antimony, Bismuth, Air samples.

Concentrations of 15 atmospheric aerosol trace elements in Livermore, California, were measured by neutron activation analysis in 2-hour filter samples for 58 hours during 3 typical summer days. All elements showed cyclic patterns with concentration variations of factors of 3 to 10. Three basic patterns were seen: (1) Na and Cl in phase with each other and nearly perfectly out of phase with the others, with a late night maximum for both; (2) All other elements except Br, showing a midafternoon maximum; and (3) Br, which had morning and evening peaks suggestive of automotive sources. Details of the patterns suggest a diurnal circulation model for the Livermore Valley involving alternation between fresh and aged marine air. Comparison of the trace element patterns with those of CO, NO2, and 'oxidant' was not definitive. (Oleszkiewicz-Vanderbilt)
W73-11277

AREAWIDE TRACE METAL CONCENTRATIONS MEASURED BY MULTIELEMENT NEUTRON ACTIVATION ANALYSIS - A ONE DAY STUDY IN NORTHWEST INDIANA,
Michigan State Univ., East Lansing. Dept. of Meteorology and Oceanography.
P. R. Harrison, K. A. Rahn, R. Dams, J. A. Robbins, and J. W. Winchester.
Journal of the Air Pollution Control Association, Vol 21, No 9, p 563-570, September 1971. 4 fig, 6 tab, 19 ref.

Descriptors: *Trace elements, *Metals, *Neutron activation analysis, Distribution patterns, *Indiana, Air pollution, Sampling, Heavy metals, Alkali metals, Water pollution, Hazards, Mercury, Lead, Cadmium, Statistical methods, Path of pollutants.
Identifiers: *Air samples.

A suite of 24 hour high volume air particulate samples, collected June 11-12, 1969, at 25 locations in the Northwest Indiana area, has been analyzed by non-destructive neutron activation analysis for 30 trace elements. Ge (Li) gamma-ray spectrometry, computer assisted data reduction and replicate analysis have been used in the study. Some elements, such as Na, K, Ti, Al, Sm, and Eu, show only minor concentration variations over the area, while others, such as Cu, W, Cr, Zn, Sb, Ga, Br, Ag, Fe, and Ce, show large variations, indicative of important local sources. Similar distribution patterns and high correlation coefficients suggest common sources for several elements. The variations of most heavy elements significantly exceed previously reported variations of total particulate, indicating the latter to be an unsatisfactory guide for elemental distribution, especially near pollution sources. Three representative locations for measurement of elemental abundances in the area are suggested. The influence of meteorological conditions and the potential Lake Michigan pollution hazard are discussed. (Oleszkiewicz-Vanderbilt)
W73-11278

ARSENIC, CADMIUM, COPPER, MERCURY, AND ZINC IN SOME SPECIES OF NORTH ATLANTIC FINFISH,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. Windom, R. Stickney, R. Smith, D. White, and F. Taylor.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 275-279, 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Mercury, *Zinc, *Cadmium, *Copper, Fish, Seawater, Distribution, Public health, Food drains, Food pyramids, Animal pathology, Trace elements, Atlantic Ocean, Analysis, Analytical techniques, Instrumentation, Sampling, Testing, Pollutant identification, Water pollution, Toxicity.
Identifiers: *Arsenic, *North Atlantic, Concentration, Sensitivity, *Finfish.

Arsenic, cadmium, copper, mercury, and zinc analyses of 91 individuals representing 35 species of North Atlantic finfish (Chondrichthys and Osteichthys) indicate that these metals occur at similar levels in both inshore and offshore species. Chondrichthys and Osteichthys have similar concentrations of all the metals, excepting arsenic which is higher in Chondrichthys. Analyses of various tissues in Chondrichthys reveal higher metal concentrations in the liver except for mercury which was higher in muscles. (Oleszkiewicz-Vanderbilt)
W73-11279

HEAVY METALS: FALLOUT AROUND A POWER PLANT,
Hope Coll., Holland, Mich. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-11282

STUDIES ON THE SOURCES OF POLLUTION IN DAIRY WATER: I. PROPERTIES OF THE WASTE WATER FROM POTATO STARCH FACTORIES (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
M. Takahashi, and T. Nishi.
Res Bull Obihiro Zootech Univ Ser I. Vol 7, No 1, p 35-52. 1971. Illus. English summary.
Identifiers: *Dairy water, Factories, Pollution, *Potato-D starch, Waste water, Water pollution sources.

A survey was made of the discharged wastes from 5 potato starch factories in the Tokachi district from 1968-1969. The waste water qualities in the starch manufacturing process and in the waste treating process was investigated particularly in 1 factory. Turbidity, pH, transparency, total solids, dissolved solids, suspended solids, dissolved O2, BOD, COD and potassium permanganate consumed (PPC) were determined by standard methods of sewage analysis. The averages of discharging wastes in 5 factories were BOD: 90-625 ppm; COD: 96-211 ppm; PPC: 196-481 ppm. The characteristic qualities in discharged wastes depended largely on the manufacturing process and facilities of the 5 potato starch factories and on the waste treatment. Characteristic qualities in the various starch wastes determined in the starch manufacturing process and in the waste treating process were as follows: BOD value in decanter juice was 23,000 ppm; decanter wastes 18,000 ppm; first separator wastes 22,000 ppm; second separator wastes 710 ppm. COD values were proportionate to BOD results. However, in flume wastes BOD and COD values were low, but turbidity was 850 ppm and suspended solids of 280 ppm were relatively high. Various improvements in waste treatment which were established included jet aeration equipment, protein salvage equipment, and total material salvage equipment for decanter juice. The potato starch wastes, if untreated, possibly pollute stream and ground (drinking, dairy and fishing) water.--Copyright 1972, Biological Abstracts, Inc.
W73-11284

VOLATILIZATION OF MERCURIC CHLORIDE BY MERCURY-RESISTANT PLASMID-BEARING STRAINS OF ESCHERICHIA COLI, STAPHYLOCOCCUS AUREUS, AND PSEUDOMONAS AERUGINOSA,
Washington Univ., St. Louis, Mo.
A. O. Summers, and E. Lewis.
Journal of Bacteriology, Vol 113, No 2, p 1070-1072, February 1973. 2 tab, 13 ref.

Descriptors: *Mercury, *Path of pollutants, *E. coli, *Bacteria, *Spectrophotometry, Laboratory tests, Analytical techniques, Pathology, Biology, Pseudomonas.
Identifiers: *Organomercurials.

Several bacterial strains carrying genes determining mercury resistance on naturally occurring plasmids will convert .00001 M Hg (+2) (chloride) to a form of mercury which is volatile and soluble in organic solvents. The volatilization activity is induced by exposure to HgC12. The ability to volatilize mercury from mercuric chloride seems to be a general mechanism of mercury resistance determined by plasmid-borne genes. From studies with a strain of E. coli in which the form of mercury produced is metallic mercury, it is felt likely that similar systems in other E. coli, S. aureus and P. aeruginosa tested are also producing metallic mercury from the added mercuric chloride. (Oleszkiewicz - Vanderbilt)
W73-11286

LEAD POLLUTION FROM A FACTORY MANUFACTURING ANTI-KNOCK COMPOUNDS,
Manchester Univ. (England). Dept. of Botany.
J. A. Lee.
Nature, Vol 238, No 5360, p 165-166, July 21, 1972. 1 fig, 1 tab, 9 ref.

Descriptors: *Lead, *Soils, *Fallout, *Vegetation, Biology, Biochemistry, Heavy metals, Pollutants, Investigations, Toxins, Industrial plants, Industrial wastes, Sampling, Soil analysis, Plant growth, Soils, *Air pollution.

Samples of mosses and leafy vegetation along with soil samples were taken from an area surrounding a factory producing anti-knock compounds and were analyzed for lead concentrations. Sampling sites were located up to 800 m from the factory and samples were taken in the early winter of 1971. Mosses were washed and digested in an acid mixture while leafy vegetation was digested without being washed. The lead concentrations were found by atomic absorption flame photometry. The lead concentrations in soil were negligible. Concentrations in vegetation decreased rapidly within the first 400 m but were still significant at the 800 m site. Concentrations as high as 286 ppm were found in a pasture within the 400 m radius. It is presumed that there is a seasonal fluctuation which must be taken into account when interpreting these data. (Jerome - Vanderbilt)
W73-11290

VOLCANIC EXHALATIONS AND METAL ENRICHMENTS AT MATUPI HARBOR, NEW BRITAIN, T.P.N.G.,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Bass-Backing Geobiological Lab.
J. Ferguson, and I. B. Lambert.
Economic Geology, Vol 67, No 1, p 25-37, 1972. 1 fig, 7 tab, 34 ref.

Descriptors: *Heavy metals, *Volcanoes, *Air pollution, *Sediments, *Dusts, Bacteria, Zinc, Manganese, Copper, Lead, Iron, Precipitation, Thermal water, Water pollution, Path of pollutants, Trace elements.
Identifiers: *Volcanic exhalations, Metal enrichment, *Matupi Harbor.

Geochemical investigations have been carried out in the volcano-exhalative-sedimentary environment at Matupi Harbor in an attempt to elucidate the potential of such environments for stratiform ore formation. Matupi Harbor is a sheltered basin with hot, acid springs which carry up to about 100 ppm iron, 100 ppm manganese, 2.5 ppm zinc, and slightly less than 0.1 ppm copper and lead. In comparison with the hot brines under the Red Sea, the Matupi springs have similar iron, manganese and zinc contents, and roughly one tenth the copper and lead contents. Laboratory studies indicate that sulfate-reducing bacteria are not noticeably active in the Matupi Harbor sediments unless organic matter is added. The apparent rarity of organic matter on the floor of the harbor was unexpected. It is concluded that stratiform iron-manganese deposits could form in volcano-exhalative-sedimentary environments if the rate of influx of detrital materials was much lower than at Matupi. For the formation of economic deposits of other metals, the conditions before, during or after precipitation, would have to be suitable for separating these metals from the predominant iron and manganese. (Oleszkiewicz- Vanderbilt)
W73-11292

DISTRIBUTION OF DISSOLVED MERCURY IN THE IRISH SEA,
Liverpool Univ. (England). Dept. of Oceanography.
D. Gardner, and J. P. Riley.
Nature, Vol 241, No 5391, p 526-527, February 23, 1973. 2 fig, 10 ref.

Descriptors: *Mercury, *Seawater, *Water analysis, *Distribution, Sediments, Heavy metals, Water pollution, Oceanography, Analysis, Trace elements, Sewage effluents, Path of pollutants, Distribution patterns.
Identifiers: *Irish Sea, *Mercury pollution.

Six cruises were made between July 1971 and September 1972 to collect samples in an area east of a line between St. Bees Head and Anglesey. The six surveys showed a consistent picture. The general levels of dissolved mercury in the inshore waters are similar to those found in the westerly regions examined in earlier cruises. These concentrations probably represent the equilibrium values for the distribution of mercury between water and suspended matter. Offshore, there are two areas in which the dissolved mercury concentration exceeds 200 ng/1. Concentrations of particulate mercury in dried sludges of up to 900 ng/1 were observed in the area of the Manchester sewer outfall. Tentatively, it is suggested that the observed high concentrations of dissolved mercury found at this station were liberated during bacterial decomposition of the sludge. (Oleszkiewicz - Vanderbilt)
W73-11293

TRACE ELEMENTS IN THE ATMOSPHERIC ENVIRONMENT,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 05A.
W73-11299

MERCURY IN THE MARINE ENVIRONMENT: CONCENTRATION IN SEA WATER AND IN A PELAGIC FOOD CHAIN,
Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
For primary bibliographic entry see Field 05C.
W73-11300

AUTO EXHAUST - LEAD VS AROMATICS,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
For primary bibliographic entry see Field 05A.
W73-11301

LEAD EMISSIONS FROM INCINERATED SEWAGE SLUDGE DETECTED ON TREE FOLIAGE,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 05A.
W73-11302

THE CASE AGAINST MERCURY,
Robert A. Taft Water Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05C.
W73-11303

TRACE ELEMENTS IN THE HUMAN ENVIRONMENT,
H. A. Schroeder.
The Ecologist, Vol 1, No 11, p 15-19, May 1971.

Descriptors: *Trace elements, *Toxicity, *Foods, *Human pathology, Air pollution, Water pollution, Water pollution sources, Pollutants, Metals, Public health, Cadmium, Lead, Nickel, Beryllium, Antimony, Mercury, Statistics, Environment.

Although some trace elements are biologically necessary for human health, excesses have characteristics which are hazardous or harmful. Trace elements in the environment are discussed on the basis of a controlled-environment study and statistics of air, water and food contamination from the U.S. Of the 27 trace elements found in air, five which are not toxic accumulate in humans, six are essential and have not been observed at high levels of concentration, and sixteen are considered contaminants, of which six, cadmium, lead, nickel, beryllium, antimony and mercury, are considered dangerous to humans. In a U.S. Geological Survey of water supplies, 23 trace elements were looked for, of which 16 were found in sizeable quantities. Of those 16, five are essential, ten are biologically inert and only one, lead, is toxic on life-time exposure. In the case of food, the problem is not that possibly toxic metals are present, but that essential elements are removed in the refining processes. Sources of trace elements in the environment, their interactions and their effects on longevity and human health are discussed. (Jerome - Vanderbilt)
W73-11304

POSSIBILITY OF REDUCING NITROGEN IN DRAINAGE WATER BY ON FARM-PRACTICES, (BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA).
Bureau of Reclamation, Fresno, Calif.

Copy available from GPO Sup Doc as EP1.16:13030ELY 05/72, $1.25; microfiche form NTIS as PB-221 482, $0.95. Agricultural Wastewater Studies, EPA Water Pollution Control Research Series Report No. REC-R2-71-11, DWR No. 174-14, June 1972. 83 p, 18 fig, 31 tab, 23 ref. EPA Project 13030 ELY 5-72-11.

Descriptors: *Nitrates, *Fertilizers, Lysimeters, Subsurface drainage, Denitrification, Ammonia, Crop production, Municipal wastes, *California, *Farm wastes.
Identifiers: *San Luis Service Area (Calif), *Nitrogen budget, Mineralization, Organic nitrogen.

A nitrogen balance study of the San Luis Service Area determined that the average annual nitrogen contributions from all sources other than residual soil nitrogen were approximately equal to the nitrogen removal by crops and gaseous losses. This would indicate that, although in many instances the residual-nitrates would replace some of the contributed nitrogen, especially fertilizers, animal and municipal wastes, the amount of nitrates moved to the drains would be proportional to the amounts of soluble, native nitrates in the soil. A soil sampling study at several sites thorughout the area indicated that there were a wide range in the concentrations of nitrates, ammonia and organic nitrogen in the soils and subsoil. There were extremely high concentrations of nitrates in those soils located on the interfan positions between the larger streams. Fertilizer studies in lysimeters show that in medium to heavy textured soils under normal irrigation and fertilizer management practices very little nitrogen is leached to the drains. Nitrate type fertilizer contributed more nitrogen to the drainage effluent than ammonia and slow release sulfur coated urea fertilizers. It was concluded that the best possibilities to reduce nitrogen in drains by on farm practices will be to establish Farm Advisory Programs to encourage the most efficient farm management and fertilizer practices and to design drain systems to promote denitrification and reduce the area swept by the drain flow lines. (EPA)
W73-11324

A STUDY OF THE PHOTODEGRADATION OF COMMERCIAL DYES,
Clemson Univ., S.C. Dept. of Textiles.
J. J. Porter.
Copy available from GPO Sup Doc as EP1.23/2:73-058, $1.25; microfiche from NTIS as PB-221 483, $0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-73-058, March 1973. 94 p, 50 fig, 39 tab, 24 ref. EPA Project 12090 EOX.

Descriptors: *Dyes, *Chemical degradation, *Textiles, *Industrial wastes, Color.
Identifiers: *Photodegradation.

The stability of thirty-six different commercial dyes in water to visible and ultraviolet light from a carbon arc has been studied. The dyes were selected on the basis of their importance in the textile industry from six major classes: basic, acid, direct, vat, disperse and sulfur dyes. A comparison is made for two of the dyes between laboratory fading rates and fading rates in natural sunlight. Both dyes degraded at least 10 times more rapidly in artificial light than in sunlight. Some previously identified degradation products of Basic Green 4 were confirmed, and a mechanism of their formation was proposed. A significant difference in degradation rate was observed between water-soluble dyes and pigment dispersions. This study showed that most commercial colors are resistant to photodegradation and many weeks would be required to produce appreciable dye degradation in a natural aquatic environment. (EPA)
W73-11325

AERIAL SURVEILLANCE SPILL PREVENTION SYSTEM,
McDonnell Aircraft Co., St. Louis, Mo. Reconnaissance Lab.
C. L. Rudder, C. J. Reinheimer, and J. L. Berrey.
Copy available from GPO Sup Doc as EP1.23/2:72-007, $3.00; microfiche from NTIS as PB-221 484, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-007, August 1972. 112 p, 45 fig, 3 tab. EPA Project 15080 HOK, Contract No. 68-01-0140.

Descriptors: Water pollution sources, Oil spills, Chemical wastes, *Remote sensing, *Aerial, Photography, Photogrammetry, Water pollution control.
Identifiers: *Multiband photography, *Photographic mensuration, *Color photography, Photointerpretation, Hazardous materials.

An aerial surveillance system, consisting of four Hasselblad comeras and Zeiss RMK 1523 camera, was evaluated for the remote detection of both real and potential spills threatening inland waterways. Twenty-three multiband and baseline missions were flown over oil refineries and other industrial sites located adjacent to the Mississippi River. Baseline flights were effective in counting storage tanks, locating and identifying storage equipment and pipeline systems and determining like conditions. Stereoscopic analysis of baseline imagery was used to estimate the height of tanks and dikes, drainage patterns and the area of openly stored waste products. The multiband imagery was obtained by combining each of nine filters with each of three different black and white films. Spectral contrast image enhancement was accomplished by either suppressing or transmitting the target reflected radiation through proper film/filter selections. Spills, effluents and waste areas were hence identified on the multiband imagery. Normal and false color imagery was evaluated with the multiband imagery to determine the best film/filter combinations for the areas of interest. Finally the personnel, equipment and procedures required to implement an aerial surveillance spill prevention system were determined. (EPA)
W73-11326

BIOLOGICAL REMOVAL OF CARBON AND NITROGEN COMPOUNDS FROM COKE PLANT WASTES,
American Iron and Steel Inst., New York.
For primary bibliographic entry see Field 05D.
W73-11328

DYESTUFF COLOR REMOVAL BY IONIZING RADIATION AND CHEMICAL OXIDATION,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 05D.
W73-11329

FISH AND FOOD ORGANISMS IN ACID MINE WATERS OF PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11332

NUMERICAL THERMAL PLUME MODEL FOR VERTICAL OUTFALLS IN SHALLOW WATER,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
D. S. Trent, and J. R. Welty.
Copy available from GPO Sup Doc as EP1.23/2:73-162, $4.80; microfiche from NTIS as PB-221 488, $0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-73-162, March 1973. 486 p, 215 fig, 12 tab, 113 ref. EPA Project 16130 DGM.

Descriptors: *Waste water disposal, *Heated water, *Turbulent flow, Jets, Temperature, Prediction, *Thermal pollution, *Outfalls, Model studies, Water pollution control, *Heat transfer.
Identifiers: *Plume models.

A theoretical study of the heat and momentum transfer resulting from a flow of power plant condenser effluent discharged vertically to shallow, quiescent coastal receiving water is presented. The complete partial differential equations governing steady, incompressible, turbulent flow driven by both initial momentum and buoyancy are solved using finite-difference techniques to obtain temperature and velocity distributions in the near field of the thermal discharge. Turbulent quantities were treated through the use of Reynolds stresses with further simplification utilizing the concept of eddy diffusivities computed by Prandtl's mixing length theory. A Richardson number correlation was used to account for the effects of density gradients on the computed diffusivities. Results were obtained for over 100 cases, 66 of which are reported, using the computer program presented. These results ranged from cases of pure buoyancy to pure momentum and for receiving water depths from 1 to 80 discharge diameters deep. Various computed gross aspects of the flow were compared to published data and found to be in excellent agreement. Data for shallow water plumes and the ensuing lateral spread are not readily available; however, one computed surface temperature distribution was compared to proprietary data and found also to be in reasonable agreement. (EPA)
W73-11333

ASSESSING THE WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS,
Little (Arthur D.), Inc., Cambridge, Mass.
J. B. Berkowitz, G. R. Schimke, and V. R. Valeri.
Copy available from GPO Sup Doc as EP1.23/2:73-179, $0.75; microfiche from NTIS as PB-221 489, $0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-73-179, April 1973. 34 p, 12 fig, 1 tab, 2 ref. EPA Project 16080 GNC.

Descriptors: Water pollution sources, *Municipal wastes, *Domestic wastes, *Heavy metals, Pollutant identification, Pollutants, Sewage, *Waste identification, Wastes, *Industrial wastes.
Identifiers: *Manufactured products.

A Catalog has been compiled of manufactured products which may, during their normal use or disposal, results in water pollution. The Catalog is in three sections, and the products are grouped in accordance with the Standard Industrial Classification (SIC). Section I summarizes the pollution potential of each listed product group. Section II provides data on typical chemical compositions for each product group and indicates the types of water-pollutional effects associated with each chemical ingredient. Section III inverts Section II by providing an alphabetical listing of chemicals and the SIC codes in which they occur. Along with the Catalog, a simple model has been developed to estimate rates of pollutant entry into the waterways, via various routes. A guide including examples is provided on how to use the Catalog and associated models to assess potential water pollution problems arising from finished products in common use. (EPA)
W73-11334

RADIATION, EVAPORATION AND THE MAINTENANCE OF TURBULENCE UNDER STABLE CONDITIONS IN THE LOWER ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-11343

A POWER WIND LAW FOR TURBULENT TRANSFER COMPUTATIONS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-11344

COMPUTING EVAPOTRANSPIRATION BY GEOSTROPHIC DRAG CONCEPT,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-11345

UNIFIED FORMULATION OF WALL TURBULENCE,
Ebasco Services Inc., New York.
For primary bibliographic entry see Field 02D.
W73-11346

SENSITIVITY OF THE SOLUTION FOR HEAT FLUX OR EVAPORATION TO OFF-DIAGONAL TURBULENT DIFFUSIVITIES,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-11347

PERTURBATION SOLUTION OF AN EQUATION OF ATMOSPHERIC TURBULENT DIFFUSION,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-11348

A SOLUTION FOR SIMULTANEOUS TURBULENT HEAT AND VAPOR TRANSFER BETWEEN A WATER SURFACE AND THE ATMOSPHERE,
Cornell Univ., Ithaca, N.Y., School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02D.
W73-11349

A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOL. V, JAMAICA BAY RAINSTORMS,
New York City-Rand Inst., N.Y.
E. C. Gritton.
Rand Report No. R-1010-NYC, July 1972. 44p, 9 fig, 4 ref.

Descriptors: *Bays, *Estuaries, Coasts, *Storm surge, Flooding, Storm drains, *Storm runoff, *Sewage, Treatment facilities, Bacteria, Coliform, Water quality, Model studies, Simulation analysis, *New York.
Identifiers: *Jamaica Bay (NY), Spring Creek.

A simulation model measuring the effects of storm-drain flooding on the water quality of Jamaica Bay, New York, is presented. Sewage entering Jamaica Bay in dry weather is treated, but storm runoff can overtax treatment plants, whereupon untreated water enters the bay. Four runs of the model of the bay were used to simulate the effect of two typical rain storms, one at high tide and one at ebb tide. Each was simulated with and without the effects of a new treatment facility at Spring Creek. The simulations yield contrasting printouts showing coliform-bacteria concentrations both on contour maps and in concentration histories at stations in the bay. Spring Creek influences the quality of bay water more than does any other drainage basin. The new plant significantly retards the increase of bacteria in the bay following a storm; but after rainstorms, the Spring Creek facility alone cannot maintain bay water at quality standards. (See also W72-06980; W72-06979; W72-08257 and W71-04038) (Ensign-PAI)
W73-11351

NONLINEAR PARAMETER ESTIMATION IN WATER QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
J. S. Shastry, L. T. Fan, and L. E. Erickson.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, Proceedings paper 9798, p 315-331, June, 1973. 7 fig, 7 tab, 30 ref.

Descriptors: *Water quality, *Model studies, *Statistical methods, *Biochemical oxygen demand, *Environmental engineering, Parametric

hydrology, Least squares method, Estimating, Computer programs, Dissolved oxygen, Systems analysis, *California.
Identifiers: *Sacramento River (Cal.), Parametric equations, Nonlinear parameters.

Water quality in streams, lakes and estuaries is generally measured in terms of the dissolved oxygen concentration and biochemical oxygen demand. Mathematical models for describing the behavior of DO and BOD are briefly reviewed. Three specific models are examined and parameters in these models are estimated using a nonlinear parameter estimation technique. Water quality data for parameter estimation were obtained from the Sacramento River survey. Statistical analysis is performed on the results obtained by calculating the residuals and F ratios for equality of variances. Results show that a model with a nonlinear decay term for BOD fits the data better than does the frequently used model with a linear decay term. (Bell-Cornell)
W73-11361

THE CHANGING CHEMISTRY OF THE OCEANS.

Proceedings of 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden, D. Dyrssen and D. Jagner, editors. Wiley Interscience Division of John Wiley and Sons, Inc, 1972. 365 p, $21.50.

Descriptors: *Water chemistry, *Sea water, Ocean circulation, Meteorology, Nitrogen compounds, Air-water interfaces, Films, Aerosols, Carbon dioxide, Mercury, Path of pollutants, Chlorinated hydrocarbon pesticides, Biodegradation, Ecosystems, Model studies, Sedimentation, Manganese, Dusts, Sulfides, Pyrite, Phosphates.

The 20th Nobel Symposium dealt with physical, chemical and biological processes in the oceans including air-sea and sea-bottom interactions, with special reference to man's impact on these processes. The topics discussed include ocean and atmospheric circulation, nitrous oxides in air and water, surface films, marine aerosols, carbon dioxide cycle, mercury, chlorinated hydrocarbons, microbial activity, ecosystems, sedimentary cycles, manganese nodules, airborne dust, iron sulfide, sulfur budget, and phosphate budget. (Knapp-USGS) (See W73-11368 thru W73-11386)
W73-11367

PHYSICAL MODELS OF LARGE SCALE OCEAN CIRCULATION,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02E.
W73-11368

LARGE-SCALE AND LONG-TERM FLUCTUATIONS IN SOME ATMOSPHERIC AND OCEANIC VARIABLES,
National Weather Service, Silver Spring, Md. Extended Forecast Div.
For primary bibliographic entry see Field 02B.
W73-11369

NITROUS OXIDE IN AIR AND SEA WATER OVER THE ATLANTIC OCEAN,
Max-Planck-Institut fuer Chemie, Mainz (West Germany).
J. Hahn.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 53-69, 1972. 8 fig, 1 tab, 19 ref.

Descriptors: *Water chemistry, *Sea water, *Nitrogen cycle, Denitrification.
Identifiers: *Nitrous oxide.

Denitrifying bacteria in soil can produce N20 so that this compound is expected to be in the atmosphere. Soil bacteria are the major source and photochemical dissociation in the troposphere and stratosphere is the major sink for N20. All N20 data show a very systematic decrease in concentration with altitude. N20 data were collected from the surface air of large sections of the Atlantic Ocean. The N20 concentration in seawater was measured at the same stations. Some high N20 supersaturations are found in seawater. This may indicate N20 production in the sea. (See also W73-11367) (Knapp-USGS)
W73-11370

IMPACT OF NATURAL AND MAN-MADE SURFACE FILMS ON THE PROPERTIES OF THE AIR-SEA INTERFACE,
Naval Research Lab., Washington, D.C. Ocean Science Div.
W. D. Garrett.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 75-91, 1972. 4 fig, 33 ref.

Descriptors: *Oil-water interfaces, *Oily water, *Sea water, *Monomolecular films, Oil spills, Path of pollutants, Surface tension, Surfactants, Air-water interfaces.
Identifiers: Surface films (Sea water).

Oceanic surface films influence various properties of the air-sea interface and modify exchange processes between the atmosphere and the ocean. Small waves are resisted and attenuated, and the interaction between wind and waves is uncoupled through the elimination of form drag. Gas exchange is inhibited by films of oil, but not to a serious extent in the open ocean. Liquid-solid exchange is altered, organic fallout is concentrated at the surface by organic films, and a mechanism exists whereby oil is transported into the marine atmosphere where it may influence atmospheric processes. In general, a large sea slick or oil film serves to damp its environment by replacing a high-surface-tension, dynamic water surface with a more phlegmatic, less mobile, organic-air interface. Although the ratio of contaminant to natural film-forming material in the sea is increasing, the natural oceanic background of organic matter is still large in comparison to the man-made input. However, spills of oil, river inputs or ocean dumping can create localized conditions where the resulting surface films are predominantly a result of human activity. (See also W73-11367) (Knapp-USGS)
W73-11371

SOME ASPECTS OF THE GEOCHEMISTRY OF MARINE AEROSOLS,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
For primary bibliographic entry see Field 02K.
W73-11372

THE CHEMICAL STABILITY OF THE OCEANS AND THE CO2 SYSTEM,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W73-11374

MERCURY--A CASE STUDY OF MARINE POLLUTION,
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
A. Jernelov.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 161-169, 1972. 7 fig, 8 ref.

Descriptors: *Mercury, *Path of pollutants, *Sea water, *Trophic level, Water chemistry, Organic matter, Food chains, Translocation, Water pollution sources, Water pollution effects.

Mercury in water exists almost entirely bound to suspended particles. Conversion of inorganic mercury to methyl mercury occurs in the surface layer of the sediment or on suspended organic particles in the water. A normal conversion rate in a Swedish lake is 0.1% per year of the total mercury present. In an oligotrophic system most energy and matter on one trophic level is transferred to the next. In an eutrophic system a larger proportion of the energy and matter on one trophic level goes to decomposition and a smaller proportion is transferred to the next trophic level. This means that a smaller proportion of the methyl mercury which accumulates in organisms will reach the top predators with the critical concentrations. If there is a high nutrient level in the aquatic system, the sedimentation rate will be high and thus tend to cover the mercury-rich sediment. Tidal areas and estuaries are favorable for high methylation rates, which could mean that the organisms there naturally contain high concentrations of mercury, but also that they are specially sensitive to further contamination. Due to the extreme oligotrophic characteristics of the high sea and lack of buffering sediment, marine top predators can increase their mercury levels as an effect of changes in the ecosystem other than an increase in the total mercury concentration. (See also W73-11367) (Knapp-USGS)
W73-11375

A FEW COASTAL POLLUTION PROBLEMS IN JAPAN,
Tokyo Univ. (Japan). Dept. of Urban and Sanitary Engineering.
For primary bibliographic entry see Field 05C.
W73-11376

CHLORINATED HYDROCARBONS IN OPEN--OCEAN ATLANTIC ORGANISMS,
Woods Hole Oceanographic Institution, Mass.
G. R. Harvey, V. T. Bowen, R. H. Backus, and G. D. Grice.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 177-186, 1972. 1 fig, 1 tab, 16 ref.

Descriptors: *Atlantic Ocean, *Chlorinated hydrocarbons, *DDT, Polychlorinated biphenyls, Food chains, Absorption, Fish, Crustaceans, Surface waters, Deep water.
Identifiers: Cape Verde Islands, Bermuda.

A series of organisms collected from the open North Atlantic Ocean demonstrated PCB in all samples and DDT in most samples. No strong evidence was obtained of an east-west gradient in concentration between the Cape Verde Islands and Bermuda. These findings agree with a systematic increase in concentration along food chains, although the mechanisms of uptake may be different for PCB than for DDT. Fish and crustacea which feed near the sea surface at night but move to considerable depths during the day show DDT and PCB concentrations to be quite similar to those of predaceous organisms that remain mostly in the upper layers. This may indicate that biological removal processes help to control chlorinated hydrocarbon concentrations in the open ocean. (See also W73-11367) (Ensign-PAI)
W73-11377

MICROBIAL ACTIVITY AS A BIOGEOCHEMICAL FACTOR IN THE OCEAN,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
Y. I. Sorokin.

In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16e20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 189-204, 1972. 11 fig, 5 tab, 26 ref.

Descriptors: *Aquatic microorganisms, *Biochemistry, *Sea water, *Biodegradation, Food chains, Water chemistry, Organic matter, Sulfur, Nitrogen, Aquatic bacteria, Geochemistry.
Identifiers: Biogeochemistry.

The metabolism of the microbial population of the ocean is a basic agent in the biogeochemical turnover of the aquatic environment. During the process of microbial decomposition, most of the organic matter entering the water basin or having been produced in it is oxidized. The decomposing activity of chemoautotrophic bacteria is responsible for the turnover of sulfur, nitrogen and iron. Anaerobic decomposition promotes oxidation of organic molecules and reduction of sulfur and nitrogen compounds. (See also W73-11367) (Knapp-USGS)
W73-11378

ON THE AGE OF STABLE ORGANIC MATTER--AQUATIC HUMUS IN OCEANIC WATERS,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
B. Skopintsev.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 205-207, 1972. 17 ref.

Descriptors: *Organic matter, *Sea water, *Humus, Suspended load, Aqueous solutions, Biodegradation, Bottom sediments, Sedimentation.

Dissolved organic matter from the deep (1,900 m) waters of the Northeast Pacific Ocean, is 3,400 years old, whereas the carbon in the inorganic matter is only from 2,194 to 1,480 years old. About 80% of the dead residue of plankton and bacteria consists of easily assimilated organic compounds and the remainder, 20%, of newly formed organic matter in the form of very complex compounds, characterized by a relatively high biological stability. This is the aquatic humus, about 1/4 existing in dissolved form, and 3/4 in suspended form. About 5% of organic carbon reaches the bottom of the oceans yearly in the form of particles. The total annual income of aquatic humus to the ocean is 13.3 times 10 to the 14th power g/year. (See also W73-11367) (Knapp-USGS)
W73-11379

FACTORS CONTROLLING MARINE ECOSYSTEMS,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 05C.
W73-11380

CHEMICAL CYCLES WITH ENERGY CIRCUIT MODELS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 02A.
W73-11381

MAN'S ROLE IN THE MAJOR SEDIMENTARY CYCLE,
Scripps Institution of Oceanography, La Jolla, Calif.
E. D. Goldberg.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., N.Y., p 267-288, 1972. 10 tab, 33 ref.

Descriptors: *Sedimentation, *Leakage, Pollutants, *Halogenated pesticides, *Oils, *Heavy metals, *Lead, *Mercury, Metals, Radioisotopes, Fossil fuels.
Identifiers: Halogenated hydrocarbons.

The general problem of leakage of materials into the environment due to man's activities is reviewed. The sizes of the leakages introduced into the sedimentary cycle are approaching, and in a few cases exceeding those of geological processes. The order of magnitude of the total material introduced naturally into the atmosphere and oceans is computed; this is compared with the mass of man-produced pollutants directly through waste of materials and indirectly through the increase of erosion rates due to land use. Special attention is given to the magnitude of fossil fuel related pollutants. Estimations of the yearly production rates of the following types of pollutants are given: Halogenated hydrocarbons, heavy metals, particularly lead and mercury, other metals, artificial radioisotopes and finally, synthetic organics other than halogenated hydrocarbons. (See also W73-11367) (Ensign-PAI)
W73-11382

GEOLOGICAL, GEOCHEMICAL AND ENVIRONMENTAL IMPLICATIONS OF THE MARINE DUST VEIL,
Liverpool Univ. (England). Dept. of Oceanography.
R. Chester.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of Johy Wiley and Sons, Inc., p 291-305, 1972. 1 fig, 6 tab, 28 ref.

Descriptors: *Path of pollutants, *Sedimentation, *Dusts, *Sea water, *Water chemistry, Fallout, Heavy metals, Lead, Zinc, Mercury, Cadmium, Pesticides, Winds.

There is a veil of continentally supplied dust over the oceans. The presence of this dust veil has important geological, geochemical and environmental implications. One of the most important of these may be that the atmosphere provides a transport pathway for solid material to the oceans which is genetically different from that of river transport. Solids brought by dust and by river sediments behave differently in their reactions with seawater. Some trace element removal occurs when the dusts enter the water column. The presence of the dust veil over the oceans offers a mechanism for the input of pollutants to seawater. Some pollutants are introduced directly into the atmosphere. Among these are pesticides from crop spraying, solids and gases as waste products of social and industrial activity, and volatile elements such as Zn, Hg, Pb, and Cd. (See also W73-11367) (Knapp-USGS)
W73-11383

MANGANESE NODULES AND BUDGET OF TRACE SOLUBLES IN OCEANS,
Tata Inst. of Fundamental Research, Bombay (India).
S. Krishnaswamy, and D. Lal.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 307-320, 1972. 1 fig, 5 tab, 43 ref.

Descriptors: *Trace elements, *Sea water, *Manganese, *Bottom sediments, Water chemistry, Geochemistry, Chemical precipitation, Sedimentation.
Identifiers: *Manganese nodules.

Manganese nodules were used for studying the rates of authigenic removal of trace elements to the ocean floor. In the open ocean, manganese nodules grow by accumulation of hydrogenous components, and their growth is often not continuous in time. On the average they accumulate at the rate of about a few cms per million yrs. (See also W73-11367) (Knapp-USGS)
W73-11384

THE ACCELERATION OF THE HYDROGEOCHEMICAL CYCLING OF PHOSPHORUS,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Stumm.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., N.Y., p 329-346, 1972. 9 fig, 1 tab, 27 ref.

Descriptors: *Coasts, *Estuaries, *Phosphorus, Balance of nature, Ecology, *Oxygen requirements, Sewage, Drainage, Industrial wastes, Storm runoff, Nutrients.
Identifiers: *Hydrogeochemical cycling, Mineralization, Anoxic conditions.

The global phosphorus circulation and the effects of man's activities on it are analyzed. The increased mining and use of phosphorus disturbs the ecological balance and creates undesirable conditions in inland waters, estuaries and coastal waters. The increase in phosphorus, although of little consequence to the oxygen reserves of the deep waters, augments markedly the marine environments with intermittent or permanent oxygen deficient conditions. Present drainage systems for sewage, industrial waters and storm water runoff accelerate the transport of nutrients and other pollutants to the rivers and the sea. The trapping of nutrients is most efficient in estuaries and fjords. Algae grown from these nutrients are carried seaward and eventually settle and become mineralized. The products from this mineralization are carried landward producing anoxic conditions in coastal waters. Examples are given of several Norwegian fjords and parts of the Baltic Sea. (See also W73-11367) (Ensign-PAI)
W73-11385

SULFATE REDUCTION, PYRITE FORMATION, AND THE OCEANIC SULFUR BUDGET,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
R. A. Berner.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 347-361, 1972. 5 fig, 4 tab, 22 ref.

Descriptors: *Water chemistry, *Sea water, *Sulfur, Sulfides, Sulfates, Pyrite, Weathering, Chemical precipitation, Sedimentation, Hydrogen sulfide, Dissolved oxygen, Oxidation-reduction potential.
Identifiers: Sulfur budget.

Every year 368 million tons of dissolved sulfate are delivered to the ocean by rivers. Only two processes are of possible importance in removing this sulfate from seawater. One is the precipitation of calcium sulfate and the other is the bacterial reduction of sulfate to hydrogen sulfide which is precipitated as pyrite, FeS2. Calcium sulfate is considerably undersaturated in normal seawater so that evaporation to salinities over three times the average is necessary to reach saturation. The present ocean contains no significant evaporite basins where calcium sulfate is precipitated. Therefore, dissolved sulfate must be removed from the ocean at present by the formation of sedimentary pyrite. The primary limitations upon how much sulfate can be ultimately removed from seawater and fixed as pyrite are: the availability of bacteriologically metabolizable organic matter; the

concentration and rate of deposition of detrital iron compounds which can react with H2S to form iron sulfides; and the rate of replenishment of sulfate in the sediment via diffusion from the overlying water. The annual removal of sulfur is estimated to be 6 million tons per year. This is far less than the amount delivered by rivers. Unless considerable sulfur is removed in shallow water, especially within deltaic complexes where there are high rates and large volumes of sedimentation, it appears that the oceans are badly out of balance relative to the removal of sulfur. (See also W73-11367) (Knapp-USGS)
W73-11386

A STUDY OF COASTAL WATER QUALITY IN THE VICINITY OF SAN JUAN, PUERTO RICO, JANUARY 13-31, 1971.
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.

Available from NTIS, Springfield, Va 22151 as PB-213 445 Price $3.00 printed copy; $0.95 microfiche. Technical Services Program Publication, February 1971. 42 p, 6 fig, 12 tab.

Descriptors: *Water quality, *Water pollution sources, *Estuaries, *Puerto Rico, *Water analysis, Chemical analysis, Industrial wastes, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Oil wastes, Bacteria, Coliforms, Plankton, Sediments, Tidal effects, Bays, Coasts.
Identifiers: *San Juan area (PR).

A water quality investigation in the coastal environs of the greater San Juan, Puerto Rico, area was conducted during the period January 13-31, 1971. The primary purpose was to document the extent of water pollution in the San Juan area with particular reference to violations of Puerto Rico's Coastal Water Quality Standards. San Juan Bay, Martin Pena Canal, and San Jose Lagoon are classified for industrial use in the Standards. Water quality criteria for this classification include: a minimum dissolved oxygen (DO) concentration of 4.5 mg/liter; a maximum temperature of 93 deg F or no more than 4 deg F above ambient; and a pH between 6.8 and 8.5. Analyses of samples taken in upper San Juan Bay showed DO violations in 41% of all samples taken. The pH was greater than 8.5 in 63% of the samples from San Jose Lagoon and greater than 8.5 in samples from Martin Pena Canal. Cooling water discharges from the Palo Seco thermal power plant caused temperatures to exceed 93 deg F at the mouth of the Bayamon River. Also included are data on bacteria, chemical analysis, plankton, oil, solids, and sediments. (Woodard-USGS)
W73-11388

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1972,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-11404

ROLE OF IRON SULFIDES IN THE ACCUMULATION OF TRACE ELEMENTS IN BLACK SEA SEDIMENTS (ROL' SUL'FIDOV ZHELEZA PRI NAKOPLENII MIKROELEMENTOV V OSADKAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W73-11409

SOME PROBLEMS IN THE GEOCHEMISTRY OF MOLYBDENUM IN THE MEDITERRANEAN SEA (NEKOTORYYE VOPROSY GEOKHIMII MOLIBDENA V SREDIZEMNOM MORE),
Akademiya Nauk SSSR, Gelendzhik. Institut Okeanologii.
For primary bibliographic entry see Field 02K.
W73-11410

CONDITIONS OF PRESERVATION OF CHLOROPHYLL, PHEOPHYTIN, AND HUMIC SUBSTANCES IN BLACK SEA SEDIMENTS (USLOVIYA SOKHRANNOSTI KHLOROFILLA, FEOFITINA I GUMINOVYKH VESHCHESTV V OTLOZHENIYAKH CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 02J.
W73-11411

DISTRIBUTION AND COMPOSITION OF MINERAL WATER IN THE TUVA AUTONOMOUS REPUBLIC (ZAKONOMERNOSTI RASPROSTRANENIYA I SOSTAV PODZEMNYKH MINERAL'NYKH VOD TUVY),
Institut Zemnoi Kory, Irkutsk (USSR).
For primary bibliographic entry see Field 02F.
W73-11412

DISTRIBUTION OF TRACE ELEMENTS IN BODIES OF WATER OF KAZAKHSTAN (RASPREDELENIYE MIKROELEMENTOV V VODOYEMAKH KAZAKHSTANA),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Khimicheskikh Nauk.
For primary bibliographic entry see Field 02K.
W73-11413

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE,
Worcester Polytechnic Inst., Mass.
For primary bibliographic entry see Field 05C.
W73-11423

VOLUME TRANSPORT, SALINITY DISTRIBUTION AND NET CIRCULATION IN THE DUPLIN ESTUARY, GEORGIA,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 02L.
W73-11425

MAJOR AND TRACE ELEMENT LOADING OF CENTRAL MICHIGAN LAKES,
Michigan State Univ., East Lansing. Dept. of Geology.
C. M. Spooner.
Available from the National Technical Information Service as PB-221 536, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, Michigan State University, Institute of Water Research, June 1973. 21 p, 2 fig, 5 tab, 11 ref. OWRR A-066-MICH (1), 14-31-0001-3822.

Descriptors: Sedimentation, *Lakes, Chemical reactions, *Michigan, Water pollution sources, Trace elements, *Lake sediments.
Identifiers: *Lake Lansing (Mich), Kettle Lake (Mich).

This preliminary investigation was undertaken to determine major, minor and trace element levels and their variation with depth in recent sediment cored from a small medi-Michigan lake. The objective is to identify chemical gradients in the unconsolidated sediment and correlate them with human activity in the area. During the geologically recent human occupation of the region, it was expected that certain metals introduced into the lake water would become incorporated in some fashion into the sedimentary column. A core from Lake Lansing, Michigan penetrating to a depth of 60 cm sampled in 30 cm layer of organic material and 30 cm of an underlying clay. Concentration profiles with depth show increases in the uppermost layer for sodium, potassium and manganese when compared to concentration means from the 20 to 60 cim depth. The percentage increases for Na, K, and Mn are 56%, 84% and 48% respectively. Thorium shows a 47% decrease in concentration. This concentration gradient in the topmost layer is ascribed to chemical influxes resulting from cultural development in the region. Since it is likely that diffusion into the sediment is taking place and that redistribution of the elements is taking place as decay of the organic material proceeds, it is not possible to calculate with any accuracy the total burden of these elements that has been imposed upon the lake. The rare-earth element results show that Ep-pH conditions which change through time, have an important effect on those elements capable of existing in more than one oxidation state.
W73-11427

INVESTIGATIONS INTO THE OCCURRENCE OF COLIFORM ORGANISMS FROM PRISTINE STREAMS,
Michigan State Univ., East Lansing. Dept. of Microbiology.
W. N. Mack.
Available from the National Technical Information Service as PB-221 537, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, Michigan State University, Institute of Water Research, June 1973. 17 p, 1 fig, 8 tab, 9 ref. OWRR A-068-MICH (1), 14-31-0001-3822.

Descriptors: *Coliforms, Aquatic microorganisms, *Water pollution sources, Lake Michigan, *Bioindicators, Pollutant identification.
Identifiers: *Lactose fermentation, *Millecoquins River (Michigan), Lake Millecoquins (Michigan).

Samples of water taken from the shoreline of northern Lake Michigan contain relatively large numbers of coliform organisms. After testing the water off-shore in Lake Michigan, it was determined that the coliform organisms along the beach of northern Lake Michigan probably came from the rivers and creeks emptying into the lake. During the summer of 1971, a survey was made of all streams emptying into Lake Michigan from the Millecoquins River, west of the village of Naubinway, Mich. to Scott Point, south of the village of Gould City, Mich. Small creeks and streams feed Millecoquins Lake which in turn is drained by the Millecoquins River into Lake Michigan. The river is a waterway draining an area where man has populated the surface and maintained domestic animals. Most of the streams entering Lake Michigan have their source in remote areas where there are no farms and except for a few hunters and fishermen during their respective seasons, these areas are isolated. Recent findings by other investigators indicate that the coliform organisms are widespread in nature and suggest that the animal populations in remote areas are responsible for the dissemination of the organisms. It appears that the coliform organisms are part of the natural habitat of these streams and cannot be used as an index of fecal pollution. The present study was designed to show that the lactose fermenting coliform organisms present in these streams are part of the natural flora of the stream and that under certain conditions these organisms multiply in the water, thus accounting for their large numbers.
W73-11428

PREDICTION MODELING FOR SALINITY CONTROL IN IRRIGATION RETURN FLOWS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 05G.
W73-11441

IRON BACTERIA--A LIKELY SUBJECT OF CO-ORDINATED RESEARCH,
P. Stumes.
Water and Pollution Control, Vol 106, No 1, p 34-35. January, 1968.

Descriptors: Corrosion, Corrosion control, Bacteria, Iron, *Iron bacteria, Chlorination, Water supply, Water wells, Microorganisms, Soil microorganisms, *Soil bacteria, *Research priorities, Pipes, Domestic water, Canada.
Identifiers: Testing laboratories.

Inconveniences and nuisances caused by the presence of iron bacteria include: the filamentous wastes of some species which form unsightly specks in water; ferrous compounds which stain laundry a reddish color, oily by-products which impart an unpleasant taste and odor to water; clogging of pipes, filters, etc. by bacterial colonies or their accumulated wastes; and the acceleration of corrosion by certain types of bacteria. Quite frequently, the presence of iron bacteria is not even recognized. Often the cause of complaint is assumed to be a form of mineral iron; regular iron removal techniques are in these cases ineffective. Some suggestions are offered as to potential areas for research with regards to defining the soil types, depth levels, water chemistries, motive forces, etc. important to the life systems of iron bacteria. The intent is to stimulate discussion and exchange of opinion which could provide impetus for research on the subject of iron bacteria at many levels. (Campbell-NWWA)
W73-11471

ORGANIC LOADING OF PETENWELL RESERVOIR, WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05C.
W73-11486

REPORT ON EVALUATIONS OF WASTE SOURCES IN THE CALCASIEU RIVER BASIN, LOUISIANA.
National Field Investigations Center-Denver, Colo.

Available from NTIS, Springfield, Va 22151, as PB-213 781 Price $3.00 printed copy; $0.95 microfiche. Environmental Protection Agency Office of Enforcement Report, January 1972. 202 p, 15 fig, 47 tab, 5 ref, 7 append.

Descriptors: *Water pollution sources, *Industrial wastes, *Water quality, *Louisiana, Streams, Bayous, Chemical analysis, Chemical industry, Oil industry, Pulp and paper industry, Thermal pollution, Pollution abatement.
Identifiers: Calcasieu River basin (La).

The Calcasieu River basin in the southwestern corner of Louisiana is the State's second largest industrialized area. Industries on the lower portion of the Calcasieu River are principally involved in the production of chemicals, petrochemicals, and petroleum products. Several firms on the upper portions of the river are processing tall oil and producing Kraft paper. All of these industries are discharging waste waters into the Calcasieu River or its tributaries. An industrial waste inventory is presented including information on the types of materials produced and raw materials used at each plant, as well as the process additives, water supplies, and wastewater treatment procedures. Fourteen industries discharge daily at least 82,000 lbs of COD; 597,000 lbs of TOC; 601,000 lbs of suspended solids; and 22.4 X 10 to the 12th power calories of heat. Analyses of bottom sediments showed that industrial waste solids are being deposited in the Calcasieu River, a navigable stream, and in its tributary streams and bayous. (Woodard-USGS)
W73-11529

MOVEMENT OF ACAROL AND TERBICIL PESTICIDES DURING DISPLACEMENT THROUGH COLUMNS OF WABASSO FINE SAND,
Florida Univ., Gainsville. Dept. of Soil Science.
R. S. Mansell, W. B. Wheeler, L. Elliott, and M. Shaurett.
In: Proceedings of Soil and Crop Science Society of Florida, Vol 31, p 239-243, December 1971. 6 fig, 2 tab, 9 ref. OWRR A-013-FLA (5).

Descriptors: *Water pollution sources, *Pesticides, *Path of pollutants, Laboratory tests, Analytical techniques, Soil types, Sands, Soil management, Agronomy, Citrus fruits, Vegetable crops, Evaluation.
Identifiers: *Acarol, *Terbacil.

Experiments were conducted to evaluate water pollution potential from pesticides. Aqueous solutions of C-14 labeled Acarol miticide and Terbacil herbicide were displaced through 30 cm columns of Wabasso fine sand taken from 0-10 and 33-76 cm profile depths. The pesticides were applied to each column when the soil was initially air-dry and later after the soil had attained water saturation. Each application had a volume of 25 ml and solute concentrations of 1 ppm miticide or herbicide and 3.3 ppm Cl (as NaCl). Liquid scintillation measurements of C-14 and Cl radiations in equal portions of column effluent with time was used to construct breakthrough (elution) curves for each solute. Analysis of these curves revealed that relative mobilities for the solutes in Wabasso fine sand were in the order, Cl>Terbacil>Acarol. Only negligible movement of Acarol was observed for each column displacement. (Woodard-USGS)
W73-11537

CRUDE OIL BEHAVIOR ON ARCTIC WINTER ICE,
Coast Guard, Washington, D.C. Pollution Prevention Projects Branch.
T. J. McMinn.
Available from NTIS, Springfield, Va 22151 as AD-754 261 Price $4.85 printed copy; $0.95 microfiche. Coast Guard Office and Research and Development Final Report, 1972. 67 p, 21 fig, 3 tab, 7 ref, 3 append.

Descriptors: *Oil spills, *Cold regions, *Ice, *Snow, *Arctic, On-site investigations, Testing procedures, Movement, Absorption, Tracking techniques, Path of pollutants.
Identifiers: Oil spill removal.

Oil spill behavior in an Arctic winter environment was investigated using small controlled oil spills during January 1972 on the Bering Sea in northwestern Alaska. To duplicate a real world spill as closely as possible, a Prudhoe Bay crude oil was used as the test oil. Investigated were oil spread rates on snow and ice, oil absorption into snow and ice surfaces, aging of oil on snow and ice surfaces, and effectiveness of various cleanup procedures. Oil spreading over ice and snow is dominated by gravity and inertia forces. Spreading rate is independent of the properties of the oil and is not affected by temperature. Terminal pool size of a known volume of oil is, however, indirectly related to temperature. Basic detection and recovery problems exist when spilled oil is subjected to snowfall or high winds. Snow tends to combine with pooled oil until the oil is effectively saturated with snow crystals. The resulting mixture may be as high as 80% snow. After saturation (which can happen in a few hours time) additional snow covers the oil making visual detection of areal extent impossible. The oil snow mixture is quite easily handled mechanically (shovel, bulldozer, etc.) but cannot be burned or absorbed. (Woodard-USGS)
W73-11539

THE ENVIRONMENTAL TRITIUM CONCENTRATION OF UNDERGROUND WATER AND ITS HYDROLOGICAL INTERPRETATION,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 02F.
W73-11544

RADIONUCLIDES IN TRANSPORT IN THE COLUMBIA RIVER FROM PASCO TO VANCOUVER, WASHINGTON,
Geological Survey, Washington, D.C.
W. L. Hauschild, H. H. Steven, Jr., J. L. Nelson, and G. R. Dempster, Jr.
Available from GPO, Washington, D.C. 20402 Price $0.75. Geological Survey Professional Paper 433-N, 1973. 43 p, 13 fig, 35 tab, 35 ref.

Descriptors: *Path of pollutants, *Radioactive wastes, *Radioisotopes, *Columbia River, Cooling water, Water pollution sources, Washington, Radiochemical analysis.
Identifiers: *Hanover (Wash).

Radionuclides in the Columbia River originated in discharges of cooling-water effluent from the reactors on the U.S. Atomic Energy Reservation at Hanford, Washington. All the contributing reactors were shut down by 1971. A progressive decrease in the concentrations and discharges of many radionuclides during the study period was attributable to the decrease in the number of operating reactors. Concentrations and discharges of the radionuclides also varied seasonally in patterns that were used to categorize the particulate and dissolved radionuclides into five classes. Concentrations of radionuclides in classes 1, 2, and 4 varied seasonally in dissolved parent materials in the cooling water. Concentrations of class 3 radionuclides varied with dilution of a source with constant strength. Concentrations of class 5 radionuclides varied with the seasonal variation in water discharge. Specific activities of zinc-65 and chromium-51 at Vancouver varied inversely with concentration of suspended sediment. The hydrodynamic and sedimentation characteristics of the Columbia River and the chemical characteristics of the radionuclides were important factors affecting the disposition of the radionuclides discharged at Pasco. (Knapp-USGS)
W73-11549

DISPOSAL OF URANIUM-MILL EFFLUENT BY WELL INJECTION IN THE GRANTS AREA, VALENCIA COUNTY, NEW MEXICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05E.
W73-11551

MEASUREMENT OF SALT-WEDGE EXCURSION DISTANCE IN THE DUWAMISH RIVER ESTUARY, SEATTLE, WASHINGTON, BY MEANS OF THE DISSOLVED-OXYGEN GRADIENT,
Geological Survey, Washington, D.C.
W. A. Dawson, and L. J. Tilley.
Available from GPO, Washington, D.C., 20402. Price $0.25 (paper cover). Geological Survey Water-Supply Paper 1873-D, 1972. 27 p, 11 fig, 10 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Estuaries, *Tidal effects, *Washington, Data collections, Methodology, Water quality, Dissolved oxygen, Salinity, Saline water intrusion, Water levels, Tides, Water temperatures, Correlation analysis, Tracking techniques.
Identifiers: *Duwamish River estuary (Wash), Salt-wedge movement, Dissolved oxygen gradient.

The Duwamish River estuary in the State of Washington has been the object of a series of comprehensive studies to predict the effects of the changing character of waste-water inputs on the water quality of the estuary. Freshwater and saltwater relations of the estuary are discussed. The distance that the saltwater wedge in the estuary moves upstream and downstream with the tide is measured by a method that utilizes the persistence of the longitudinal gradient of dissolved oxygen in the saltwater of the wedges. The method, though

unorthodox, can serve as an independent check on any other measurements of tidal-excursion distance. Typical values obtained were a 1-km excursion for a 1.3-m tide range and a 3-km excursion for a 3-m tide range. This method of tracing the water movement seems to work because of two unusual aspects of the Duwamish River estuary: (1) the channel configuration is simple and well-suited to synoptic measurement, and (2) the physical properties of the entering saltwater are nearly constant. (Woodard-USGS)
W73-11564

SYSTEM STUDY FOR SURVEILLANCE OF OCEAN DUMPING OPERATIONS.
Sperry Rand Corp., Great Neck, N.Y. Sperry Systems Management Div.

Available from NTIS, Springfield, Va 22151 as AD-735 378, Price $3.00 printed copy; $0.95 microfiche. Publication No GB-2500-1072 (NP), September 1971. 219 p, 13 fig, 3 tab, 19 ref, 9 append. ACE Contract DACW 51-71-C-0024.

Descriptors: *Water pollution sources, *Waste disposal, *Solid wastes, *Tracking techniques, Instrumentation, Barges, Atlantic Ocean, New York, Remote sensing, Radar, Evaluation.
Identifiers: *Ocean dumping operations, *New York Bight.

A study of surveillance of ocean dumping operations in the New York Bight is described. General requirements, system approaches, and system specifics are discussed. Applicable candidate systems are described and are rated using customized evaluation and analysis techniques, including consideration of total cost of ownership. The preferred system thus defined is described in the text and in appended hardware procurement and installation specifications. The preferred system utilized Loran A for position fixing, draft sensing for detecting the occurrence of dump, and means for recording these as well as important events. For maximum application flexibility, a dump detection subsystem is added to a basic system. The basic system, contained in a single black-box, requires minimal vessel preparation and has the advantages of transportability in that it can be placed aboard a vessel upon short notice. No system configuration requires a connection between a towed dumper and the towing tug. Furthermore, the preferred system requires no major development effort. The system concept involves the recording every six minutes of vessel position as determined by automatic tracking Loran receivers, the recording of important events as they occur, and the recording of draft sensing if desired. Provision is also made for recording other dump status signals like dump valve status. (Woodard-USGS)
W73-11573

PETROLEUM HYDROCARBONS AND FATTY ACIDS IN WASTEWATER EFFLUENTS,
Woods Hole Oceanographic Institution, Mass.
J. W. Farrington, and J. G. Quinn.
Journal Water Pollution Control Federation, Vol 45, No 4, p 704-712, April 1973. 2 fig, 2 tab, 28 ref.

Descriptors: *Waste water (Pollution), *Sewage effluents, *Pollutant identification, *Sewage treatment, *Oil, Separation techniques, Treatment facilities, Organic compounds, Solvent extractions, Lipids, Water sampling, Gas chromatography, Organic acids.
Identifiers: *Fatty acids, *Flame ionization gas chromatography, Sample preparation, Animal fat, Vegetable oil, Chemical concentration, Hydrocarbons, Column chromatography, Thin layer chromatography, Organic solvents.

Samples of the effluent from three secondary treatment plants were surveyed to determine fatty acid and hydrocarbon distributions and concentrations. The samples were obtained in glass containers with aluminum-lined caps. Lipid extracts were obtained by either (1) extracting the acidified effluent with chloroform, saponifying the lipid residues with 0.5 N KOH in (1:1) benzene:methanol, acidifying the saponified extract, and partitioning the lipids into petroleum ether; or (2) refluxing subsamples with 0.5 N KOH in (1:1) benzene:methanol, acidifying the extract and partitioning the lipids into petroleum ether. Fatty acid analysis was carried out using flame ionization gas chromatography. Hydrocarbons were also analyzed by gas chromatography after isolation from the effluent lipid extracts by column and thin-layer chromatography. The analyses confirm that the predominant fatty acids ratios in effluents are 16:0, 18:0, 18:1. The relative abundance of these acids suggests animal fats and vegetable oils as their sources. Concentrations of fatty acids ranged from 0.73 to 43.05 mg/l. Petroleum hydrocarbons are discharged by two of the treatment plants studied. Hydrocarbon concentrations ranged from none detected for the effluent of one treatment plant to 16.2 mg/l for the effluent of another. These results confirm suggestions that significant amounts of petroleum hydrocarbons are discharged in effluents. (Holoman-Battelle)
W73-11575

DDT, DDE, AND POLYCHLORINATED BIPHENYLS IN BIOTA FROM THE GULF OF MEXICO AND CARIBBEAN SEA--1971,
Texas A and M Univ., College Station. Dept. of Chemistry.
C. S. Giam, A. R. Hanks, R. L. Richardson, W. M. Sackett, and M. K. Wong.
Pesticides Monitoring Journal, Vol 6, No 3, p 139-143, December 1972. 1 fig, 2 tab, 9 ref.

Descriptors: *Pesticide residues, *DDT, *DDE, *Polychlorinated biphenyls, *Crabs, *Shrimp, *Marine fish, Chlorinated hydrocarbon pesticides, Gas chromatography, Sampling, Freezing, Crustaceans, Mollusks, Invertebrates, Elasmobranchs, Sharks.
Identifiers: *Biological samples, Sample preparation, Flounders, Cephalopods, Squid, Sea pansy, Flying fish, Tunicates, Squirrelfish, Batfish, Croakers, Rock shrimp, White tip shark, King mackerel, Tuna, Parrot fish, Red snapper, Triggerfish, Yellow tailed snapper, Jack fish, Barracuda, Macroinvertebrates.

Samples of fish and crustaceans (shrimp, crabs, and others) were collected by net and by hook and line from the Gulf of Mexico and the Caribbean Sea for analysis of residues of DDT, DDE, and PCB. Samples were put in mason jars and frozen until analysis by gas chromatography. Fish and crustaceans were analyzed whole except when fish muscles and organs were removed for separate analysis. Recoveries were 85 percent or better with spiked samples, and detection limits ranged from 0.1 to 0.3 micrograms per kg wet weight for DDT and DDE and 1 to 3 micrograms per kg for PCB's. All three compounds were found widely distributed in all biota; however, samples from coastal areas generally had higher levels than samples from open waters. The ratios of DDE to DDT varied widely between samples. Livers from larger fish generally contained higher levels of DDE than DDT, possibly indicating the capability of this organ to metabolize DDT. Fish liver usually had the highest concentration of all three compounds and muscle tissue the lowest. (Little-Battelle)
W73-11580

PROGRESS REPORT ON WATER QUALITY OF LAKE MICHIGAN NEAR CHICAGO,
Chicago Dept. of Water and Sewers, Ill.
J. C. Vaughn, and P. A. Reed.
Water and Sewage Works, Vol 120, No 5, p 73-80, May 1973. 5 fig, 13 tab, 1 ref.

Descriptors: *Water quality, *Water quality standards, *Lake Michigan, *Surveys, Water pollution, Bioindicators, Illinois, Water policy, Water properties, Odor, Coliforms, Bacteria, Activated carbon, Color, Water temperature, Hydrogen ion concentration, Iron, Dissolved oxygen, Ammonia, Nitrogen, Chlorides, Fluorides, Phenols, Sulfates, Phosphates, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Manganese, Nickel, Nitrites, Oil, Zinc, Phosphorus, Dissolved solids, Water sampling, Heavy metals, Organic compounds, Halides.
Identifiers: Chemical indicators, Hydrocarbons, Fecal streptococci, Fecal coliforms, Methylene blue active substance, Cyanides, Filterable residues, Arsenic, Barium, Carbon chloroform extract, Selenium, Silver.

Data are presented primarily from the South Water Filtration Plant (SWFP) operation and test information on various water quality parameters of Lake Michigan near Chicago. These data were compared to the Illinois Pollution Control Board (IPCB) standards. The comparisons with the IPCB standards lead, not surprisingly, to the same general conclusions as those based on the repealed regulation SWB-7. One may tentatively conclude that relatively little sewage plant effluent is entering the lake in the area of interest. The data do not permit exact analysis or differentiation but the principal sources of pollution appear to be industrial wastes and possibly runoff. The spotty pattern of changes in concentration, with improvement in some respects (coliform, phenol, and annomia nitrogen, as examples) and deterioration in others, also suggests that the most useful method of further investigation would concentrate on investigation of specific possible sources. Any other approach would probably be out of date and inappropriate. (Holoman-Battelle)
W73-11581

NUTRIENT RATIO VARIATION IN RESERVOIR SEDIMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. C. Hendricks, and J. K. G.Silvey.
Journal Water Pollution Control Federation, Vol 45, No 3, p 490-497, March 1973. 5 fig, 2 tab, 18 ref.

Descriptors: *Nutrients, *Sediments, *Variability, Reservoirs, Aquatic soils, Soil analysis, Chemical analysis, Carbon, Texas, Sampling, Phosphates, Bottom sediments, Nitrogen, Nitrates, Hypolimnion.
Identifiers: *Garza-Little Elm Reservoir, Organic carbon, Kjeldahl nitrogen, Heterotrophy, Enrichment, Sample preparation.

Chemical analyses were performed on a number of sediment samples collected from two sections of Garza-Little Elm reservoir, near Dallas, Texas. These analyses consisted of ash-free weights, organic carbon, Kjeldahl nitrogen, phosphates, and nitrates. The results indicated that the area richest in nutrients was in deep water where a hypolimnion existed in the summer. Cove areas were about equal in enrichment whether or not marinas were located on them. Areas along the shores demonstrated least enrichment. (Holoman-Battelle)
W73-11591

PHOSPHORUS IN WASTE WATER,
New York State Dept. of Environmental Conservation, Albany. Research and Development Unit.
For primary bibliographic entry see Field 05D.
W73-11592

PESTICIDE DEGRADATION BY MARINE ALGAE,
Wisconsin Univ., Madison. Dept. of Entomology.
G. M. Boush, and F. Matsumura.

Available from the National Technical Information Service as AD-754 841. Report No. 1, February 1, 1973. 7 p, 2 tab, 8 ref. Contract No. N00014-67-A-1028-0023.

Descriptors: *Marine algae, *Pesticides, *Degradation (Decomposition), DDT, Methodology, Chlorophyta, Diatoms, Systematics, Radioactivity techniques, 2 4-D, 2 4 5-T, Plant growth, Marine plants, Plant morphology, Biodegradation, Carbon radioisotopes, Chrysophyta, Water pollution, Phytoplankton, Chlorinated hydrocarbon pesticides, Insecticides, Path of pollutants.
Identifiers: *Pure cultures, Fate of pollutants, Metabolites, Thin layer chromatography, Autoradiography, C-14, Porphyridium, Cyclotella nana, Nannochloris, Chaetoceros galvestonensis, Neochloris, Amphidinium carteri, Dunaliella tertiolecta, Neochloris, Tetraselmis, Agmenellum quadruplicatum, Rhodomonas torula, Coccochloris elabans, Oscillatoria williamsii, Isochrysis galbana, Phaeodactylum tricornutum.

A collection has been developed of marine algae representative of the major groups in pure culture. An improved technique has been developed to effectively survey algae for potential degradative ability with reference to pesticides. The pesticide is added to the algal cultures in the log, or active growth phase. The cultures are then analyzed for metabolites after a 7-day incubation period. Such a procedure allows for a minimum possibility of pesticide inhibition of growth. All pesticides were C-14-labeled and degradation products were examined by comparative TLC and autoradiography. Marine algae, in general, appeared to be influenced by low levels (ppb range) of many pesticides adversely. Pesticide degradation abilities appeared less than those encountered with bacteria. (Holoman-Battelle)
W73-11601

STUDY OF THE RESPIRATION AND THE NITROGEN AND PHOSPHORUS EXCRETION OF ZOOPLANKTONIC POPULATIONS OF THE MAURITANIAN UPWELLING, (MARCH-APRIL 1972). (ETUDE DE LA RESPIRATION ET DE L'EXCRETION D'AZOTE ET DE PHOSPHORE DES POPU LATIONS ZOOPLANETONIQUES DE L'UPWELLING MAURITANIEN (MARS--AVRIL 1972),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre de Recherches Oceanographiques.
R. P. LeBorgne.
Marine Biology, Vol 19, No 3, p 249-257, April 1973. 9 fig, 4 tab, 29 ref.

Descriptors: *Nitrogen, *Phosphorus, *Respiration, *Zooplankton, Nutrients, Marine animals, Sea water, Cycling nutrients, Mathematical studies, Equations, Estimating, Animal metabolism, Phosphates, Animal populations, Carbohydrates, Lipids.
Identifiers: *Excretion, Nutrient flux, Ammonium, Mauritanian upwelling, Correlation coefficients, Organic phosphorus, Catabolism.

Fifty-six eperiments were run for 22 h on 200-micron-net zooplankton in non-filtered sea water. The equations of orthogonal regression lines between respiration, and mineral, total nitrogen, and phosphorus excretion rates have been computed for 14 stations in the upwelling Mauritanian area. Correlation coefficients are high: excretion values may be estimated from respiration values in order to follow the N and P flux through the Mauritanian zooplankton populations. O:N, O:P, N:P, mineral: total excretion ratios are calculated for each station and are not significantly different in the 3 areas of the upwelling area studied. On the average, 48 percent of excreted phosphorus is thoroughly oxidized into phosphate and needs 142.4 atoms in respiration per P atom. The remainder, excreted as organic phosphorus, requires the same amount of oxygen for its later mineralization. The O:P ratio thus obtained is close to the theoretical - 276. Fifty four percent of the nitrogen excreted is mineral and the O:N-NH4 (plus) ratio shows a dominant carbohydrate and fat catabolism. The N:P ratio is constant, and close to 10 for both mineral and total excretion. (Holoman-Battelle)
W73-11603

DISPERSED AND PARTICULATE PETROLEUM RESIDUES IN THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia).
E. M. Levy, and A. Walton.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 261-267, February 1973. 3 fig, 13 ref.

Descriptors: *Water pollution sources, *Oil pollution, *Oily water, *Distribution, *Sea water, Pollutant identification, Chemical analysis, Water pollution, Oil, Water sampling, Solvent extractions, Path of pollutants, Water analysis, Methodology.
Identifiers: *Gulf of St. Lawrence, *Petroleum residues, Fluorescence spectrophotometry, Sample preparation.

Concentrations of petroleum residues both as material in solution or dispersed through the water column and as fresh oiltarry particles floating on the surface in the Gulf of St. Lawrence were measured during July-August 1971. Niskin samplers were used to collect water samples for dissolved and dispersed oil determinations from varying depths at stations 1.9, 7.6, and 18.5 km from the site of a sunken barge. CC14 extracts were analyzed by fluorescence spectrophotometry. The sea surface was sampled by towing a modified neuston sampler for one nautical mile at 5-7 knots. The sample was frozen for later processing and fresh oil was removed from the net with CC14. Dissolved and dispersed forms were present in concentrations generally less than 5 ppb over the southern and western regions while 5-10 ppb were encountered in the north and east. A major source of these residues appears to be the Atlantic water that enters through Cabot Strait, and the distribution of these materials is closely related to the circulation of water within the Gulf. Surface oil was present at approximately 50 percent of the stations occupied in concentrations generally less than 100 micrograms/sq m but as great as 12,400 micrograms/sg m in the vicinity of the sunken barge Whale. There is no evidence to indicate an appreciable change in concentrations to those of a year ago. (Holoman-Battelle)
W73-11612

NITROGEN AND PHOSPHORUS UPTAKE BY CHLORELLA PYRENOIDOSA IN SEWAGE TREATMENT PROCESSES,
Harvard Coll., Cambridge, Mass.
T. M. Michel, and J. L. Michel.
Water and Sewage Works, Vol 120, No 3, p 76-79, March 1973. 3 fig, 21 ref.

Descriptors: *Nitrogen, *Phosphorus, *Nutrient removal, *Sewage effluents, *Sewage treatment, *Absorption, *Domestic wastes, Cultures, Chemical analysis, Aquatic algae, Chlorophyta, Nutrients, Nitrates, Nitrites, Chlorophyll, Suspended solids, Biochemical oxygen demand, Coliforms, Hydrogen ion concentration, Dissolved oxygen, Chemical oxygen demand, Photosynthesis, Temperature, Ammonia, Biomass, Eutrophication.
Identifiers: *Chlorella pyrenoidosa, *Assimilation, Scenedesmus acutus, Substrate utilization, Quantitative analysis, Fecal coliforms, Organic nitrogen, Kjeldahl nitrogen, Organic phosphorus.

The alga, Chlorella pyrenoidosa, was grown using the primary effluent of a domestic sewage treatment plant as a nutrient base and studied specifically for its ability to utilize the nitrogen and phosphorus forms present in the secondary stages of wastewater treatment. To study N and P assimilation, a controlled system in a batch culture format was set up which included a method for continuous monitoring of DO, pH and culture temperature. Samples of primary effluent were analyzed for basic nutrient data and then placed in the culture vessels. Tests were conducted for between 48 and 168 hours on the metabolic behavior of the algae and on the patterns of nutrient assimilation. All soluble, precipitate and total forms of organic and inorganic P were measured, and quantitative analyses of total Kjeldahl N, organic N and NH3 were made. Culture samples were analyzed for coliform organisms, cell count and mass, chlorophyll, NO2, NO3, suspended solids, BOD, COD, DO, and pH. Photosynthetic activity was determined by evaluating DO concentrations. About 50 percent of all P forms present in the primary effluent were removed by Chlorella. Media pH rose during the initial bloom periods but tended to stabilize over the entire run. During an experimental run period there was a significant drop in the number of fecal and total coliform group organisms present. N uptake closely paralleled the rate of biosynthetic activity and over 80 percent of the N forms present were removed. Experimentation showed that growth and nutrient assimilation rates for Chlorella pyrenoidosa far exceed those of the strain of Scenedesmus acutus isolated from the sewage samples. (Holoman-Battelle)
W73-11617

PESTICIDES IN WATER,
Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
J. S. Bradshaw, E. L. Loveridge, K. P. Rippee, J. L. Peterson, and D. A. White.
Pesticides Monitoring Journal, Vol 6, No 3, p 166-170, December 1972. 2 fig, 1 tab, 13 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Freshwater fish, *Chemical analysis, *Water analysis, *Water pollution sources, Insecticides, Water sampling, Channel catfish, Carp, White bass, Path of pollutants, Utah, Dieldrin, DDT, DDE, Aldrin, Heptachlor, Bullheads, Catfishes.
Identifiers: *Utah Lake, *Seasonal variation, Sample preparation, Electron capture gas chromatography, Gas liquid chromatography, Black bullhead, Methoxychlor, Heptachlor epoxide, Lindane, Alph-BHC, Cyprinus carpio, Ictalurus punctatus, Ictalurus melas, Morone chrysops, Roccus chrysops, Bioaccumulation, Animal tissues.

Gallon-water samples were taken from 15 tributaries and 1 outlet point of Utah Lake biweekly from March 1 - July 1, 1970, and weekly or semiweekly through February 1971. The samples were extracted as soon as possible (within 3 days) with nanograde petroleum ether in a continuous liquid-liquid extractor for 24 hours. The ether extract was dried, filtered, evaporated to 10 ml, and analyzed for pesticide residues by electron capture gas chromatography. Fish caught in the lake were analyzed by gas-liquid chromatography. The water samples were found to contain aldrin, alpha-BHC, gamma-BHC, heptachlor, heptachlor epoxide, methoxychlor, DDT, and DDE. DDE, dieldrin, methoxychlor, DDT, and BHC were found in the fish analyzed, with DDE being the most common. The smaller and younger fish contained lesser amounts of DDE. Definite surges of pesticides (1 ppb or more) were shown to enter Utah Lake three times per year - early spring, late spring, and fall, generally corresponding to the application times of pesticides by farmers in the area. The pesticides involved were mainly aldrin and BHC in the early spring; heptachlor (plus heptachlor epoxide) and methoxychlor in the late spring; and aldrin, heptachlor and methoxychlor in the late fall. (Holoman-Battelle)
W73-11618

ORGANOCHLORINE INSECTICIDES IN SURFACE WATERS IN GERMANY-1970 AND 1971,
Bundesgesundheitsamt, Berlin (West Germany).
For primary bibliographic entry see Field 05C.
W73-11628

SPRING PHYTOPLANKTON ABUNDANCE AND PRODUCTIVITY IN GRAND TRAVERSE BAY, LAKE MICHIGAN, 1970,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. F. Stoermer, C. L. Schelske, M. A. Santiago, and L. E. Feldt.
Available from the National Technical Information Service as COO-2003-14. Report, April 1972. 20 p, 1 fig, 3 tab, 18 ref. Grant No. GA-4507.

Descriptors: *Standing crops, *Primary productivity, *Phytoplankton, *Diatoms, Water sampling, Turbidity, Nitrates, Silica, Phosphorus, Aquatic algae, Seasonal, Dominant organisms, Photosynthesis, Nansen bottles, Secchi disks, Chemical properties, Depth, Chrysophyta, Protozoa, Spring, Lake Michigan.
Identifiers: *Species diversity, *Grand Traverse Bay, Particulate matter, Stephanodiscus spp, Diatoma spp, Cyclotella spp, Fragilaria spp, Synedra filiformis, Flagellates, Rhizosolenia spp, Tabellaria fenestrata, Melosira spp, Asterionella formosa.

Water samples were taken from twelve stations in Grand Traverse Bay using a Nansen bottle cast on May 20, 1970, at 5 m and June 18, 1970, at depths of 5 m from the surface and 1 m above the bottom. Secchi disc transparencies, particulate P, nitrate, silica and carbon fixation rates were measured. Phytoplankton cell number and species composition were determined microscopically. In May 1970, the phytoplankton abundance (standing crop) ranged from 1455 to 3355 cells/ml and increased significantly in June from 2500 to 6469 cells/ml. The same populations dominated the assemblages at all stations and estimated diversity of assemblages was relatively high and uniform, ranging from 2.3 to 2.6 in May to 1.8 - 2.2 in June. Estimates of primary productivity in May from the same stations ranged from 3.8 mg C/cu m/hr to 9.1 mg C/cu m/hr and followed the same general pattern of areal distribution as the standing crop estimates. Estimates of primary productivity were more variable during the June sampling period, with values ranging from 2.7 mg C/cu m/hr to 13.4 mg C/cu m/hr, with greatest differences again being between most productive stations in the lower west arm and least productive stations in the upper east arm. (Holoman-Battelle)
W73-11629

THE BACTERIOLOGY OF THE WATER SUPPLIES OF RANGOON: II. COOL DRY AND HOT DRY SEASONS,
Institute of Medicine (I), Rangoon (Burma). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W73-11630

POLLUTION EFFECTS ON PHYCOVIRUS AND HOST ALGAE ECOLOGY,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-11635

THE ROLE OF NITROGEN IN THE AQUATIC ENVIRONMENT,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 05C.
W73-11640

CYCLING OF ELEMENTS OF ESTUARIES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
D. A. Wolfe, and T. R. Rice.
Fishery Bulletin, Vol 70, No 3, p 959-972, 1972. 3 tab, 47 ref.

Descriptors: *Model studies, *Heavy metals, *Estuaries, *Marine animals, Reviews, Sediments, Path of pollutants, Estuarine environment, Calcium, Mathematical models, Titanium, Magnesium, Potassium, Sodium, Cobalt, Copper, Iron, Manganese, Zinc, Aluminum, Molybdenum, Cesium, Chromium, Nickel, Strontium, Beryllium, Cadmium, Lead, Mercury, Adsorption, Ion exchange, Sedimentation, Suspension, Crabs, Clams, Benthos, Zooplankton, Oysters, Diatoms, Phytoplankton, Fish, Scallops, Shrimp, Snails, Rain, Runoff, Distribution, Salinity, Solar radiation, Suspended solids.
Identifiers: *Biotransformation, *Transport, *Bioaccumulation, Scandium, Vanadium, Silicon, Tin, Rubidium, Antimony, Arsenic, Barium, Bismuth, Selenium, Silver, Thorium, Cycling, Polychaetes, Asterionella japonica, Atlantic menhaden, Striped mullet, Bay anchovy, Blue crab, Atlantic silverfish, Atlantic croaker, Spot, Pinfish, Flounder, Bluefish, Spotted seatrout, Weakfish, Biological magnification.

Review and discussions are presented on the types of information needed to develop useful models for the cycling of contaminant metals (both radioactive and stable) in estuarine ecosystems. Basic requirements are knowledge of the major reservoirs of the metals, which in most cases are the sediment and water, the mechanisms and pathways of elemental transformation, rates of elemental turnover among reservoirs, and responses of these processes and reservoirs to environmental change. A conceptual systems model is presented as the preliminary phase in the development of dynamic mathematical models of elemental cycling. (Little-Battelle)
W73-11645

THE NEED FOR HYDROGEOLOGIC EVALUATIONS IN A MINE DRAINAGE ABATEMENT PROGRAM: A CASE STUDY, TOMS RUN, CLARION COUNTY, PENNSYLVANIA,
Pennsylvania Dept. of Health, Harrisburg. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W73-11674

INFLUENCE OF AGRICULTURAL PRACTICES ON WATER QUALITY IN NEBRASKA: A SURVEY OF STREAMS, GROUNDWATER, AND PRECIPITATION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
R. A. Olson, E. C. Seim, and J. Muir.
Water Resources Bulletin, Vol 9, No 2, p 301-311, April 1973. 3 fig, 2 tab, 11 ref. OWRR B-004-NEB (3).

Descriptors: *Water pollution sources, *Nebraska, *Fertilizers, *Irrigation practices, Farm wastes, Path of pollutants, Water quality, Nitrates, Phosphates, Nutrients, Water pollution effects, Groundwater, Surface waters.

Where nutrient levels of streams in Nebraska are elevated, the cause is usually industrial, sewage or livestock waste intrusion, and not crop production practices. The only significant quantity of nutrient N and P induced by cultivation is that accompanying sediments from eroded fields. The P content of Nebraska groundwater has remained essentially constant during the past 10 years while average NO3 has increased slightly, in a period during which farmer fertilizer use quadrupled. During the same time, irrigation acreage has increased by 50%, livestock numbers by 30%, with corresponding growth in human population and attendant industries. Irrigation practice has contributed more than any other factor to the small increase in groundwater NO3. (Knapp0USGS)
W73-11696

5C. Effects of Pollution

COMPUTER SIMULATION OF EUTROPHICATION,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella.
Available from the National Technical Information Service as PB-221 328, $3.00 in paper copy, $0.95 in microfiche. Final Report, (1973). 14 p, 11 ref. OWRR-C-1819 (3172) (2). 14-31-0001-3172.

Descriptors: *Computer models, *Eutrophication, Lake stages, Mixing, *Oregon, Simulation analysis, Mathematical models, *Dissolved oxygen, Hypolimnion, Oxygenation, Reaeration, Water temperature.
Identifiers: *Triangle Lake (Oregon).

A mathematical model describing the DO variations in a stratified lake was developed. The basic model was one-dimensional including DO variations with depth and time. The model describes the combined effect of photosynthesis, reaeration, vertical mixing and total respiration. A method of using the model to determine hypolimnetic oxygen uptake rates was presented. The model study indicated that the DO concentrations within the hypolimnetic waters of lakes were more sensitive to vertical mixing and total respiration than to photosynthetic oxygenation or reaeration. A companion field study on an eutrophic lake was partially supported by this project in order to better relate actual field results to the capabilities and limitations of the model. The temporal and spacial variations of temperature and dissolved oxygen were measured in Triangle Lake, Oregon. The lake was found to be relatively uniform in the horizontal direction and significantly vertically stratified.
W73-11051

PLANT ANALYSIS FOR NUTRIENT ASSAY OF NATURAL WATERS,
Wisconsin Univ., Madison. Dept. of Botany; and Wisconsin Univ., Madison. Inst. of Plant Development.
G. C. Gerloff.
Copy available from GPO Sup Doc as EP1.23/4:73-001, $0.95; microfiche from NTIS as PB-221 332, $0.95. Environmental Protection Agency, Health Effects Research Series Report EPA-R1-73-001, February 1973. 66 p, 5 fig, 16 tab, 26 ref. EPA Project 18040 DGI.

Descriptors: *Nutrient requirements, Deficient elements, Minerals, *Eutrophication, Aquatic weeds, *Bioassay, Fertility, *Wisconsin, Lakes.
Identifiers: *Macrophytes, *Elodea occidentalis, *Ceratophyllum demursum.

Plant analysis has been developed as a procedure for evaluating nutrient supplies and growth-limiting nutrients for nuisance macrophytes in lakes and streams. Plant analysis is based on establishing in index segments the critical concentration (Minimum plant concentration for maximum yield) of each essential nutrient element likely to limit growth of nuisance macrophytes. Critical concentrations for nitrogen, phosphorus, sulfur, calcium, magnesium, potassium, iron, manganese, zinc, boron, and molybdenum were established in appropriate index segments of Elodea occidentalis. The critical copper concentration was estimated. Critical concentrations for several elements also were established in Ceratophyllum demursum. To evaluate plant analysis as an assay procedure, index segments of Elodea and Ceratophyllum were routinely collected from Wisconsin lakes, analyzed, and the analyses were compared with the critical concentrations for indications of nutrient deficiency. Nitrogen, Phosphorus, Calcium, and copper were at or close to critical levels in one or more lakes. Neither nitrogen nor phosphorus seemed to be a general growth-limiting nutrient in the lakes sampled. (EPA)
W73-11057

AN IN SITU EVALUATION OF NUTRIENT EFFECTS IN LAKES,
Virginia Inst. of Marine Science, Gloucester Point.
R. A. Jordan, and M. E. Bender.
Copy available from GPO Sup Doc as EP1.23:73-018, $2.60; microfiche from NTIS as PB-221 341, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-018, April 1973. 227 p, 45 fig, 30 tab, EPA Project 16010 HIU.

Descriptors: *Eutrophication, *Nutrients, *Phytoplankton, *Primary productivity, Nitrogen, Phosphorus, Chelation, Lakes, *On-site investigations, Sewage effluent.
Identifiers: *Enrichment experiments, Factorial designs, Individual species responses.

A method for performing in situ nutrient enrichment experiments on natural lake phytoplankton communities was developed and evaluated. One set of experiments in which it was employed was designed to detect limiting nutrients and to provide a basis for predicting future experiment results. Productivity increased in response to all three of the treatment variables used, N, P, and EDTA, but response patterns varied from experiment to experiment. Individual species responded differently to different treatments, and interactions among the treatment variables were important in shaping the community responses to mixtures of two or three variables. The most consistent features of the productivity results were incorporated into a 'most probable response pattern,' which was partially validated by a second series of experiments. The second experiment series was also used to test the ability of NTA to stimulate phytoplankton productivity. Stimulation was continually obtained. In a third series of experiments sewage effluents were tested in parallel with N and P. Varying degrees of overlap between the species complexes responding to the sewage and to the N and P treatments were found. Recommendations for the use of in situ enrichment experiments in eutrophication studies are presented. (EPA)
W73-11070

PHOSPHORUS RELEASE FROM LAKE SEDIMENTS,
Battelle-Pacific Northwest Labs., Richland, Wash.
R. E. Wildung, and R. L. Schmidt.
Copy available from GPO Sup Doc as EP1.23 73 024, $2.00; microfiche from NTIS as PB-221 342, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-024, April 1973. 185p, 35 fig, 74 tab, 81 ref. EPA Project 16010 DUA 14-12-508.

Descriptors: *Water quality, *Eutrophication, *Phosphorus, Inorganic compounds, Organic compounds, *Sediments, Algae, Carbon, Nitrogen, Sediment-water interfaces, Mineralogy, Lake Erie, *Lake sediments, *Oregon, Minnesota.
Identifiers: Upper Klamath Lake (Ore), *Agency Lake (Ore), *Diamond Lake (Ore), Shagawa Lake (Minn).

Investigations were undertaken to characterize the major inorganic and organic forms of phosphorus in sediments of Upper Klamath Lake, Oregon, determine the potential for release of phosphorus from the sediment as influenced by water and sediment composition and environmental parameters, and establish the relationship between phosphorus release and algal growth. Sediment characterization was extended to other lake systems including Shagawa Lake in Minnesota, Agency and Diamond Lakes in Oregon and Lake Erie. Sediments of Upper Klamath Lake, although differing in their ability to release phosphorus, exhibited seasonal changes in phosphorus concentration. These changes were most pronounced in the inorganic phosphorus fraction and in a bay which received agricultural runoff and initially contained relatively large quantities of phosphorus in the sediment interstitial water. Release of and resorption of phosphorus associated with the solid phase occurred. Release appeared to be largely from non-occluded iron forms of phosphorus whereas resorption was primarily in the form of non-occluded aluminum forms of phosphorus. The rate and extent of phosphorus release, described by regression models, was related to sediment composition. Release was accelerated by increased temperature and the presence of a phosphorus sink such as an anion exchange resin in laboratory studies or actively reproducing phytoplankton in field studies. Algal growth response to phosphorus released from sediments during dialysis was approximately equivalent to the response to orthophosphate. (EPA)
W73-11072

EFFECTS OF CHEMICAL VARIATIONS IN AQUATIC ENVIRONMENTS: VOLUME I, BIOTA AND CHEMISTRY OF PICEANCE CREEK,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
W. H. Everhart, and B. E. May.
Copy available from GPO Sup Doc as EP1.23 73-011a, $2.10; microfiche from NTIS as PB-221 343, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-011a, February 1973. EPA Project 18050-DYC.

Descriptors: *Aquatic insects, Oligochaetes, Gastropods, Amphipods, Leeches, Water properties, *Colorado, Water chemistry, *Invertebrates, *Biota.
Identifiers: Stream fauna, *Oil shale (Colorado), Piceance Creek (Colo).

Sampling a small stream in the rich oil shale country of northwestern Colorado confirmed distinct seasonal trends and habitat preference in invertebrate populations. Discharge was a major influence on invertebrates and chemical composition of the stream. Seasonal variations, biomass, and species composition of invertebrates appear characteristic of oil shale area streams. (See also W73-11075 and W73-11076) (EPA)
W73-11074

EFFECTS OF CHEMICAL VARIATIONS IN AQUATIC ENVIRONMENTS: VOLUME II, TOXIC EFFECTS OF AQUEOUS ALUMINUM TO RAINBOW TROUT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
W. H. Everhart, and R. A. Freeman.
Copy available from GPO Sup Doc as EP1.23:73-011b, $0.75; microfiche from NTIS as PB-221 344, $0.95. Environmental Protection Agency, Ecological Research Series Report number, EPA-R3-73-011b, February 1973. 41 p, 8 fig, 5 tab, 22 ref. EPA Project 18050-DYC.

Descriptors: *Rainbow trout, *Aluminum, *Toxicity, Hydrogen ion concentration, Aqueous solutions, Aquatic environment, Lethal limit, Water pollution effects.

Fertilized eggs, fry, and fingerlings were exposed to aqueous aluminum complexes in neutral and basic media under constantly flowing, controlled conditions of aluminum concentration, pH, and temperature. Toxicities of various concentrations were highly pH dependent. Dissolved concentrations over 1.5 ppm aluminum caused physiological and behavioral aberrations as well as acute mortality. Toxic effects of suspended aluminum, though greater at lower concentrations, do not increase as much as the effects of dissolved aluminum with higher concentrations. Growth of trout exposed to high dosages of aluminum was reduced only as long as or slightly longer than the exposure continued. Egg and fry bioassays were conducted with exposures in trays and simulated natural redds. Fertilization was not affected by any concentrations tested, and most mortalities occurred during hatching and in the post-swim-up stage. Trends in toxicity were similar to those found with fingerlings indicating dissolved aluminum to be more toxic than equivalent suspended amounts. (See also W73-11074 and W73-11076) (EPA)
W73-11075

EFFECTS OF CHEMICAL VARIATIONS IN AQUATIC ENVIRONMENTS: VOLUME III, LEAD TOXICITY TO RAINBOW TROUT AND TESTING APPLICATION FACTOR CONCEPT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
P. H. Davies, and W. H. Everhart.
Copy available from GPO Sup Doc as EP1.23:73-011c, $1.25; microfiche from NTIS as PB-221 345, $0.95. Environmental Protection Agency, Ecological Research Series Report, EPA-R3-73-011c, February 1973. 80 p, 14 fig, 21 tab, 60 ref. EPA Project 18050-DYC.

Descriptors: *Rainbow trout, *Lead, *Toxicity, *Bioassay, Water pollution effects, Aquatic environment, Lethal limit, *Assay, Analytical techniques.
Identifiers: Application factor.

Four chronic bioassays were conducted to determine the toxicity of lead to rainbow trout. Results obtained from acute and chronic bioassays in hard water (alkalinity 243.1mg/liter) and soft water (alkalinity 26.4 mg/liter) were used to test the application factor approach as related to different water qualities. The toxicity of lead to rainbow trout in hard water was determined on a total and dissolved lead basis. The 96-hr TL50 and 'MATC' on a total lead basis were 471.mg/liter and 0.12 to 0.36 mg/liter respectively, which yielded an application factor of .0002 to .0008. Analysis of the free or dissolved lead gave a 96-hr TL50 of 1.38 mg/liter and a 'MATC' of 0.018 to 0.032 mg/liter, resulting in an application factor of .0130 to .0232. Total and free lead were considered to be the same in soft-water. The 18-day TL50 and 'MATC' obtained from the soft water bioassays were 140 micrograms/liter and 6.0 to 11.9 micrograms/liter lead respectively. Computations using the TL50 and 'MATC' values gave a soft water application factor of .0429 to .0850. The maximum acceptable toxicant concentration ('MATC') was determined in both hard and soft water bioassays on the occurrence of abnormal black tails caused by chronic lead exposure. The application factor approach as related to different water qualities was found to be very promising when lead analysis was limited to the free or dissolved metal and failed when total hard water lead concentrations were used. (See also W73-11074 and W73-11075) (EPA)
W73-11076

POLLUTION AS A RESULT OF FISH CULTURAL ACTIVITIES,
Utah State Div. of Wildlife Resources, Salt Lake City.
For primary bibliographic entry see Field 05B.
W73-11077

ANALYSIS OF ENGINEERING ALTERNATIVES FOR ENVIRONMENTAL PROTECTION FROM THERMAL DISCHARGES.
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 05G.
W73-11078

WATER QUALITY INVESTIGATIONS: SOURIS RIVER BASIN, NORTH DAKOTA, 1969,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 05B.
W73-11115

DETERMINATION OF MERCURY CONTENTS IN DIVERSE SAMPLES OF FISH AND OTHER BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS, (NEUTRONENAKTIVIERUNGSANALYTISCHE BESTIMMUNGEN VON QUECKSILBERGEHALTEN IN DIVERSEN FISCHPROBEN UND A NDEREN BIOLOGISCHEN MATERIALIEN),
Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Radiochemie.
For primary bibliographic entry see Field 05A.
W73-11123

APPLICATION OF THE FLUORESCENT ANTIBODY TECHNIQUE TO THE DIFFERENTIATION OF ASPERGILLUS SPECIES, CANDIDA SPECIES AND ZYGOMYCETES IN PARAFFIN SECTION OF FORMALIN-FIXED TISSUES,
North Carolina Univ., Chapel Hill.
For primary bibliographic entry see Field 05A.
W73-11126

STUDY OF THE CHANGES IN THE STRUCTURE OF TWO ALGAL POPULATIONS: AN R--TYPE FACTOR ANALYSIS,
Louvain Univ. (Belgium). Institut Carnoy.
For primary bibliographic entry see Field 05A.
W73-11129

PARTITIONING OF A BRACKISH WATER HABITAT BY COPEPOD SPECIES,
Ghent (Belgium). Dept. of Zoology Rijksuniversiteit.
For primary bibliographic entry see Field 05A.
W73-11130

ECOLOGY OF YELLOWSTONE THERMAL EFFLUENT SYSTEMS: INTERSECTS OF BLUE--GREEN ALGAE, GRAZING FLIES (PARACOENIA, EPHYDRIDAE) AND WATER MITES (PARTNUNIELIA, HYDRACHNELLAE),
Georgia Univ., Athens. Dept. of Zoology.
R. G. Wiegert, and R. Mitchell.
Hydrobiologia, Vol 41, No 2, p 251-271, March 29, 1973. 3 fig, 6 tab, 12 ref.

Descriptors: *Hot springs, Ecosystems, *Aquatic bacteria, *Aquatic algae, Biological communities, *Succession, Ecology, Trophic level, Parasitism, Predation, Stability, Thermal springs, Life cycles, Water temperature, Biomass, Diptera, Alkaline water, Aquatic productivity, Growth stages, Larvae, Effluents.
Identifiers: *Arthropods, *Population dynamics, Species interaction, *Water mites, Partnuniella thermalis, Paracoenia turbida, Ephydra, Lamproscatella, Urolepis, Spiders, Brine fly, Synechococcus, Species density, *Yellowstone National Park.

Studies of succession, population dynamics and species intersects of alkaline hot spring effluent communities in the Lower Geyser Basin of Yellowstone National Park have been used to define the 3 basic elements in the biological interactions of the characteristic algal-bacterial-arthropod ecosystems. The 3 major biotic elements in these communities were (1) an algal mat comprising several species of filamentous blue-green algae, (2) a primary biophage, the brine fly Paracoenia turbida, which feeds on the algal mat as both larva and adult, and (3) a red water mite, Partnuniella thermalis, whose larvae are parasitic on adult Paracoenia. Additional animals are found in this simple community; some other genera of brine fly (Ephydra, Lamproscatella), a parasitic wasp (Pteromalidae, Urolepis), and lycosid spiders are present throughout their life cycle. Other species are important components of the system (i.e. the predaceous dolicopodid flies), but they spend only part of their life cycle in or on the mat. The dominant primary producers were grazed by ephydrid flies. These in turn harbored larvae of the water mite Partnuniella. The high instrinic rate of increase of the fly enabled it to exploit temporary cool spots in the mat. The lower fecundity and longer life cycle of the mite restricted its ability to exploit temporarily suitable habitat. Thus the intersect of mites with flies is a sensitive measure of stability in the algal mat. Springs with a variable-flow pattern and consequent mat instability had both a lower mean incidence of parasitism and a lower mean larval load per fly. The data support the hypothesis that the abundance and relative densities of organisms in higher trophic levels can be predicted from knowledge of the growth and stability patterns of the filamentous blue-green algal mat in thermal spring effluents. (Holoman-Battelle)
W73-11131

ENUMERATION AND DIFFERENTIATION OF WATER BACTERIA WITH PHOSPHORUS-32,
Roorkee Univ. (India).
For primary bibliographic entry see Field 05A.
W73-11133

ISOLATION OF SALMONELLAE FROM MODERATELY POLLUTED WATERS,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 05A.
W73-11134

WATER QUALITY MODELS FOR TOTAL COLIFORM,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-11135

INFANT MORTALITY AND HARDNESS OF LOCAL WATER SUPPLIES,
Medical Research Council, London (England). Social Medicine Unit.
M. D. Crawford, M. J. Gardner, and P. A. Sedgwick.
Lancet (North Am Ed). Vol 1, No 7758, p 988-992, 1972. Illus.
Identifiers: Calcium, *England, *Infant mortality, *Wales, *Water hardness.

In the large county boroughs of England and Wales the softer the drinking-water and the less Ca it contains, the higher the infant death rate. A multiple regression study demonstrates that, after the well-known associations of infant mortality with social factors and latitude are allowed for, water Ca is an important factor in 'explaining' the differences between the infant death rates of these towns, but not between their stillbirth-rates. Differences between the towns in the proportions of births to mothers who had already had 3 or more children appear to explain a large part of the modern relationship of social factors with infant mortality, but not the association with water Ca. Anencephaly is also inversely associated with the water minerals in the towns studied; but the correlation is small.--Copyright 1972, Biological Abstracts, Inc.
W73-11144

MERCURY ACCUMULATION BY MYRIOPHYLLUM SPICATUM L.,
Wisconsin Univ., Madison. Dept. of Soil Science.
S. G. Dolar, D. R. Keeney, and G. Chesters.
Environmental Letters, Vol 1, No 3, p 191-193, 1971. 3 tab, 5 ref.

Descriptors: *Aquatic plants, *Mercury, *Sediments, *Adsorption, Biology, Plant physiology, Root systems, Organic compounds, Inorganic compounds, Soil contamination, Toxicity, Metabolism, Food chains, Evaluation, Laboratory tests.
Identifiers: Organomercurials.

An investigation of the magnitude and rate of Hg accumulation by a rooted aquatic plant--Myriophyllum spicatum L. (watermilfoil)--from solution culture and from Hg-contaminated lake sediments was conducted. As determined by solution culture experiments, Hg accumulation was much greater with inorganic than organic Hg carriers. Mercury accumulation from nutrient solution was rapid and approached maximum values in 2 hours. Organo-Hg compounds were more available than inorganic compounds from lake sediments likely because of precipitation of inorganic Hg as sulfides. Mercury accumulates in rooted aquatic plants by physical adsorption and by metabolic uptake and translocation, the latter occurring mainly with organo-Hg compounds. Rooted aquatic plants might prove to be an important link in the uptake and cycling of Hg derived from contaminated sediments. (Jerome-Vanderbilt)
W73-11168

A CONTINUOUS-FLOW APPARATUS FOR ASSESSING THE TOXICITY OF SUBSTANCES TO MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, (England). Fisheries Lab.
P. M. Connor, and K. W. Wilson.
Journal of Experimental Marine Biology and Ecology, Vol 9, No 3, p 209-215, 1972. 3 fig, 12 ref.

Descriptors: *Marine animals, *Toxicity, *Testing procedures, *Instrumentation, *Bioassay, Biochemistry, Aquatic environment, Laboratory tests, Quality control, Water meters, Flow meters, Control systems, Mechanical equipment, Marine biology.

Continuous flow systems for test procedures of acute toxicity on aquatic animals can overcome problems such as waste product accumulation, depletion of dissolved oxygen and changes in the pH and bacterial population which may result from insufficient volumes of water. An efficient continuous flow system is presented. Although the system uses electric pumps, it incorporates a fail-safe system which would maintain the experimental conditions in the event of pump failure. Sea water flows from a constant head tank through flow meters to the 10-liter Perspex treatment tanks. The entering toxin is metered by microperistaltic pumps. Maximum errors of plus or minus 3% were calculated for sea water flows of 10 l/h and plus or minus 2.4% for a toxin flow of 7 ml/h. The apparatus has run for 12 months and has proven reliable, accurate and easy to maintain. (Jerome-Vanderbilt)
W73-11169

OXIDATION OF COPPER (II) SELENIDE BY THIOBACILLUS FERROOXIDANS,
Department of Natural Resources, Quebec. Mineral Research Center.
A. E. Torma, and F. Habashi.
Canadian Journal of Microbiology, Vol 18, No 11, p 1780-1781, 1972. 1 fig, 13 ref.

Descriptors: *Bacteria, *Copper, *Oxidation, *Thiobacillus ferrooxidans, Biochemistry, Metals, Chemical reactions, Metabolism, Toxicity, Catalysts, Digestion, Hydrogen ion concentration.
Identifiers: *Selenium, Atomic absorption spectroscopy.

Thiobacillus ferrooxidans is an organism which can tolerate high metal ion concentrations and can oxidize metallic sulfides, low valency inorganic sulfur compounds, ferrous ion and some other compounds. The action of T. ferrooxidans upon copper selenide was investigated. The organism had a catalytic effect on the oxidation process. During leaching for sulfide, acid had to be added to maintain the optimum pH of 2.3. In spite of the high toxicity of selenium, the bacteria grew and multiplied. In this process copper goes into solution and elemental selenium is deposited. (Jerome-Vanderbilt)
W73-11171

ACUTE ZINC TOXICITY TO RAINBOW TROUT (SALMO GAIRDNERI): CONFIRMATION OF THE HYPOTHESIS THAT DEATH IS RELATED TO TISSUE HYPOXIA,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
D. T. Burton, A. H. Jones, and J. Cairns, Jr.
Journal of the Fisheries Research Board of Canada, Vol 29, No 10, p 1463-1466, 1972. 2 tab, 12 ref.

Descriptors: *Rainbow trout, *Zinc, *Toxicity, *Respiration, Biochemistry, Fish, Sport fish, Physiology, Cytological studies, Mortality, Metabolism, Oxygen requirements, Inhibitors, Testing.

Acute heavy metal toxicity to fish has been attributed to the coagulation or precipitation of mucus on the gills and/or to cytological damage to the gills. The physiological mechanism of death by either of the above causes is related to a breakdown in gas exchange at the gills. This study of acute zinc toxicity to rainbow trout (Salmo gairdneri) supports an earlier hypothesis that modification of the gas exchange process at the gills creates hypoxia at the tissue level. Tissue hypoxia appears to be a major physiological change preceding death once the gas exchange process at the gills is no longer sufficient to supply the oxygen requirements of the fish. (Jerome-Vanderbilt)
W73-11180

ENVIRONMENTAL HAZARDS IN THE CONTROL OF DISEASE VECTORS,
Florida State Div. of Health, Vero Beach. Entomology Research Center.
M. W. Provost.
Environ Entomol. Vol 1, No 3, p 333-339, 1972.
Identifiers: Africa, Control, *Disease vectors, Ecological studies, *Environmental hazards, Flies, Malaria, Mosquito, Tsetse.

Unwanted environmental disturbances from vector control practices (pesticides, water management, special tsetse fly control methods, etc.) are discussed. Current control methods for mosquitoes, tsetse flies, black flies and snails are examined because these are vectors of the major vector-borne diseases of the world today: malaria, filariasis, trypanosomiasis, onchocerciasis and schistosomiasis. The assessment is ecological and sociological. Although considerable damage was done, particularly to aquatic environments in Africa, control methods available today pose insignificant hazards to environments. Control of these diseases will continue to increase human populations but the peoples involved must decide what population densities to maintain at what cost to natural environments and quality of living.--Copyright 1973, Biological Abstracts, Inc.
W73-11182

ENVIRONMENT,
Colorado School of Mines, Golden. Research Inst.
R. C. Merritt.
Mining Engineering, Vol 24, No 2, p 97-101, February 1972. 4 fig.

Descriptors: *Metallurgy, *Metals, *Air pollution, *Sulfur compounds, Copper, Mining, Solid wastes, Waste treatment, Environmental effects, Stabilization, Storage tanks.
Identifiers: *Smelting, Nonferrous metals, Tailing piles.

Pollution problems troubling the metallurgical industry are presented. With the introduction of new SO2 emission standards it became apparent that existing technology available to nonferrous smelters cannot achieve 94% control with the government's estimate of $108 million. The copper industry alone would achieve only 85% control at a cost approaching $600 million. It is concluded that without huge capital investments for new production technology, the pollution standards cannot be met by nonferrous smelters. Although the paper deals primarily with SO2 emissions several case histories present facts on acid mine drainage water treatment, metal recovery processes, tailings stabilization and metals reclamation from refuse. (Oleszkiewicz - Vanderbilt)
W73-11183

METABOLISM OF TRITIATED WATER IN THE DAIRY COW,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 05B.
W73-11186

PHENYLMERCURIC ACETATE: METABOLIC CONVERSION BY MICROORGANISMS,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W73-11187

ARSENIC IN THE LIPID EXTRACTS OF MARINE INVERTEBRATES,
Akademiya Nauk SSSR, Vladivostok. Institut Biologii.
V. E. Vaskovsky, O. D. Korotchenko, L. P. Kosheleva, and V. S. Levin.
Comparative Biochemistry and Physiology, Vol 41B, No 4, p 777-784, 1972. 1 fig, 4 tab, 25 ref.

Descriptors: *Marine animals, *Arsenic compounds, *Lipids, *Chromatography, Biochemistry, Invertebrates, Mollusks, Aquatic environment, Distribution, Environmental effects, Data collection, Evaluation, Laboratory tests, Water pollution.
Identifiers: *Arsenic.

The quantitative contents of arsenic in the lipid extracts of twenty-seven species of marine invertebrates, related to various systematic groups, were determined in this study. Arsenic was found in the lipids of the representatives of all phyla. Annelida, Mollusca and Asteroidea had the highest arsenic contents whereas Spongia had the lowest. The lipids of animals of the same species with different habitats were found to have different arsenic contents. Thin-layer chromatography was used to compare arsenic-containing substances obtained from various organisms. Animals from different groups were shown to have different arsenic containing compounds. The main portions of arsenic-containing substances saponify. (Jerome-Vanderbilt)
W73-11189

TOXIC EFFECTS OF TRACE ELEMENTS ON THE REPRODUCTION OF MICE AND RATS,
Dartmouth Coll., Hanover, N.H. Dept. of Physiology.
H. A. Schroeder, and M. Mitchener.
Archives of Environmental Health, Vol 23, No 2, p 102-106, August 1971. 4 tab, 14 ref.

Descriptors: *Trace elements, *Reproduction, *Toxicity, *Rodents, *Potable water, Biochemistry, Bioassay, Metals, Animal pathology, Animal physiology, Growth rates, Metabolism, Lead, Cadmium, Arsenic compounds, Nickel, Titanium, Molybdenum, Analytical techniques, Bioindicators, Testing procedures, Evaluation, Laboratory animals.
Identifiers: Selenium.

Breeding mice and rats were exposed to low levels of six trace elements in drinking water in a controlled environment for three generations. Three elements selenium, lead and cadmium had demonstrated innate toxicities, while three others, arsenic, nickel and molydbenum had no long-term toxicity. A group of mice given only doubly deionized water was used as a control. Selenate (3 ppm) caused excess deaths before weaning, runts, and failures to breed. Lead (25 ppm) and cadmium (10 ppm) caused loss of the strain within two generations, with many abnormalities. Molybdate (10ppm) was slightly toxic and arsenic caused only elevated ratios of males to females. In rats, lead was very toxic and titanium and nickel moderately toxic, each causing early deaths and runts. This method provides fairly rapid estimates of innate toxicities of trace elements in doses tolerable for growth and survival. (Jerome - Vanderbilt)
W73-11190

PRAGUE INTERNATIONAL LEAD PANEL: EFFECTS OF ATMOSPHERIC LEAD ON BIOLOGICAL SYSTEMS,
Institute of Industrial Hygiene and Occupational Diseases, Prague (Czechoslovakia).
J. Teisinger, C. Xintaras, and E. Pfitzer.
Science, Vol 179, No 4069, p 197-198, 12 January 1973.

Descriptors: *Lead, *Environmental effects, *Absorption, *Toxicity, Toxins, Public health, Biochemistry, Air pollution, International Commission, Information exchange, Pathology, Human diseases, Animal pathology.
Identifiers: Poisoning, Body burden, Biological effects.

Proceedings of the debate on the effect of atmospheric lead on biological systems of an international panel at the Charles University in Prague, Czechoslovakia, 15 October 1970, are summarized. These discussions highlighted worldwide concern for potential damage to human health from minute concentrations of lead in the atmosphere. The panel presented information on sources of lead, kinetics of lead absorption, distribution and excretion, sensitive biologic measures of the body burden of lead, and biochemical and clinical features of lead poisoning. The discussion centered on air pollution in Japan, the United States and Czechoslovakia, and on health and safety on mine and lead smelters workers in Czechoslovakia, Finland, Germany and Poland. (Oleszkiewicz-Vanderbilt)
W73-11265

METAL TOXICITY TO SEWAGE ORGANISMS, A DISCUSSION,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-11266

ENVIRONMENTAL CONTAMINATION BY LEAD FROM A MINE AND SMELTER,
Institute of Occupational and Radiological Health, Belgrade (Yugoslavia).
D. Djurie, Z. Kerin, L. Graovac-Leposavic, L. Novak, and M. Kop.
Archives of Environmental Health, Vol 23, No 4, p 275-277, October 1971. 6 tab, 1 ref. BSS-OH-YUG-1.

Descriptors: *Lead, *Distribution, *Public health, *Mining, Environmental effects, Water pollution, Air pollution, Soil contamination, Absorption, Sampling, Evaluation, Food, Toxicity, Industrial wastes.
Identifiers: *Yugoslavia.

This preliminary report illustrates the contamination of two large areas in Yugoslavia as a result of the operation of lead mines and smelters. A large proportion of the populations in these areas have been continually subjected to atmospheric lead concentrations higher than those of urban areas but lower than those found in the air of lead-using industrial plants. Tables are presented showing: the distribution of particles of lead in the atmosphere; the concentrations of lead found in the water of the Drava and Meza Rivers, the soil of the area, plants and food products; and the concentrations of aminolevulinic acid in the urine of

persons in villages within the area of mining and smelting operations as compared to that of persons from uncontaminated areas. Significant levels of lead were present in vegetation from contaminated areas and this showed up in cow's milk which contained more than 1 mg of lead per kilogram. This level could be harmful to infants. Hay contained levels of lead which could be toxic for cattle if used exclusively and continuously. (Jerome-Vanderbilt)
W73-11267

ENVIRONMENTAL IMPACT OF TRACE METALS ON THE NEW LEAD BELT OF S.E. MISSOURI,
Missouri Univ., Rolla. Dept. of Civil Engineering; and Missouri Univ., Rolla. Environmental Health Research Center.
B. G. Wixson, E. Bolter, J. C. Jennett, and K. Purushothaman.
Paper presented at American Geophysical Union Fall National Meeting, San Francisco, California. December 6-9, 1971. 13 p, 5 fig, 2 tab, 6 ref, 1 append.

Descriptors: *Industrial wastes, *Heavy metals, *Lead, Water pollution, *Streams, *Missouri, *Eutrophication, Mining, Trace elements, Zinc, Copper, Phosphates, Carbon dioxide, Effluents, Environmental effects, Bacteria, Algae, Evaluation, Sampling, Measurements, Analytical techniques, Air pollution.
Identifiers: *Mixing wastes.

Investigations are underway in the New Lead Belt of Southeastern Missouri, to discover the effects of mining and industrial wastes on a previously unpolluted ecosystem. Sampling of both contaminated and uncontaminated streams in the same area has been possible because of the unusual topography and drainage pattern of this region. Studies of mine effluents entering streams have indicated that mining waste waters contain carbon dioxide and sufficient phosphorus to combine with nitrogen and other trace substances in the streams to cause undesirable benthic growth of bacterial-algal mats. The stresses introduced into the environment by the industry are sulfur dioxide in the tail gases, trace metals in the wind-blown lead concentrate and in the dust coming through the main stacks, and sulfur trioxide-acid mist escaping the acid plant stack. A modeling concept is presently being developed to evaluate the transport of lead and other trace metals in the study area. (Jerome - Vanderbilt)
W73-11271

TRANSFER OF METALLIC MERCURY INTO THE FOETUS,
Rochester Univ. Medical Center, N.Y.
For primary bibliographic entry see Field 05B.
W73-11274

VOLATILIZATION OF MERCURIC CHLORIDE BY MERCURY-RESISTANT PLASMID-BEARING STRAINS OF ESCHERICHIA COLI, STAPHYLOCOCCUS AUREUS, AND PSEUDOMONAS AERUGINOSA,
Washington Univ., St. Louis, Mo.
For primary bibliographic entry see Field 05B.
W73-11286

SEA FISH CONTAMINATION WITH MERCURY (CONTAMINATION DES POISSONS DE MER PAR LE MERCURE),
G. Cumont, G. Viallex, H. Lelievre, and P. Bobenrieth.
Revue Internationale d'Oceanographie Medical, Vol 28, p 95-127, 1972. 15 fig, 10 tab, 6 ref. English summary.

Descriptors: *Mercury, *Marine fish, *Trace elements, Foods, Food chains, Toxins, *Toxicity, Path of pollutants, Surface waters, Animal pathology, Heavy metals, Water pollution, Standards, Water quality, Analysis, Water pollution effects.
Identifiers: *Fish muscles, *Atomic absorption spectroscopy.

The research and the determination of mercury in the muscle of fish of various species, origin and dimensions show that the concentration of this metal is inferior to norms admitted to-day in most cases. However, the accumulation of mercury is always proportional to the weight of the fish. Consequently, the big individuals at the end of the food chains have concentrations superior to these norms. Fish from some areas show abnormally high rates, which indicate local pollution. (Oleszkiewicz-Vanderbilt)
W73-11289

MERCURY IN THE MARINE ENVIRONMENT: CONCENTRATION IN SEA WATER AND IN A PELAGIC FOOD CHAIN,
Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
P. M. Williams, and H. V. Weiss.
Journal Fisheries Research Board of Canada, Vol 30, No 2, p 293-295, 1973. 2 tab, 7 ref.

Descriptors: *Mercury, *Sea water, *Food chains, *Marine animals, Marine plants, Sediments, *California, Distribution patterns, Food pyramids, Fish, Plankton, Microorganisms, Trace elements, Water pollution effects, Neutron activation analysis.
Identifiers: *Mercury pollution.

Mercury in seawater, in a pelagic food chain, and in bottom sediment was determined at a single station 430 km southeast of San Diego, California. The concentration of mercury in zooplankton slightly increased with depth of collection. The mercury content in almost all of the higher trophic levels of organisms collected at greater depths was indistinguishable from the concentration of mercury in zooplankton at these depths. Mercury concentration in the seawater column was essentially constant below 100 m and significantly higher at the surface. This vertical profile of mercury content is not ascribable to biological activity. (Oleszkiewicz-Vanderbilt)
W73-11300

THE CASE AGAINST MERCURY,
Robert A. Taft Water Research Center, Cincinnati, Ohio.
R. B. Dean.
Available from the National Technical Information Service as PB-213 692. Paper presented at 71st National Meeting of AICHE, Dallas, Texas, February 20-23, 1972. 11 p, 25 ref.

Descriptors: *Mercury, *Heavy metals, *Toxicity, *Pathology, Analytical techniques, Path of pollutants, Fungicides, Pesticides, Toxins, Animal diseases, Human pathology, Standards, Legislation, Sediments, Sediment-water interfaces, Foods, Food chains, Water pollution, Environmental effects.
Identifiers: *Methylation, Atomic absorption spectroscopy, Organomercurials, Methylmercury.

The toxicity of mercury is increased more than tenfold when it is converted to methylmercury which destroys nerves in the brain and advances senility. Bacteria convert mercury in aquatic sediments into methylmercury which is concentrated by predatory fish. The historical background of mercury pollution is presented, followed by a discussion of the best methods for mercury detection, means by which mercury enters the environment, standards, and Environmental Protection Agency enforcement. (Oleszkiewicz - Vanderbilt)
W73-11303

CERTAIN BIOLOGICAL EFFECTS OF LEAD UPON THE ANIMAL ORGANISM,
Amsterdam Univ., (Netherlands). Coronel Lab. for Occupational Medicine and Environmental Health.
A. de Bruin.
Archives of Environmental Health, Vol 23, No 4, p 249-264, October 1971. 1 fig, 174 ref.

Descriptors: *Lead, *Human pathology, *Toxins, *Metabolism, Biochemistry, Bioassay, Environmental effects, Public health, Analytical techniques, Enzymes, Water pollution, Pollutants, Urine, Metals.
Identifiers: Human blood, Human physiology.

A comprehensive review is presented of the scientific literature relating to the biochemical and physiological results of the absorption of measurable quantities of lead into the bodies of animals and men. The influence of lead on hematopoiesis is discussed in relation to circulating erythrocytes, impairment of hemoglobin production and the stimulation of erythropoiesis in bone marrow. The association of high lead concentrations with anemia resulting from enzyme inhibition, the biochemical and physiological alteration of erythrocytes and the impairment of biosynthesis is considered. Ways in which the detection of biochemical alterations in urine, blood, bone marrow and tissue may be used to avert serious damage from clinical lead poisoning are discussed. A multiplicity of effects induced by sufficient concentrations of lead are demonstrated. (Jerome-Vanderbilt)
W73-11307

BIOCHEMICAL TESTS FOR THE APPRAISAL OF EXPOSURE TO LEAD,
Institute of Occupational and Radiological Health, Belgrade (Yugoslavia).
M. K. Stankovic.
Archives of Environmental Health, Vol 23, No 4, p 265-269, October 1971. 2 tab, 17 ref.

Descriptors: *Lead, Testing, *Urine, Environmental effects, Toxicity, Distribution, Public health, Biochemistry, Sampling, Analysis, Evaluation, Air pollution, Atmosphere, Testing procedures, Bioassay, *Amino acids.
Identifiers: *Yugoslavia, Human physiology.

Absorption of lead in sufficient quantity results in specific chemical responses in the animal metabolism. Recently investigators discovered that amino levulinic acid (ALA) is excreted in the urine of persons suffering from lead intoxication. Thus, its determination has been employed as an early sensitive indicator of excessive absorption of lead. This study presents results and discussion of a systematic observation of working men who had been exposed to lead. Four groups of men totalling 370 persons, selected from environments containing concentrations of lead ranging from no lead to 3.5 mg/cu.m. were tested. Coproporphyrin in urine was analyzed by a quantitative spectrophotometric method. ALA in urine was also measured. The results in mean values are presented in a table which shows the range across the four concentration groups. The occurrence of coproporphyrin in excessive concentrations in urine is not specific evidence of lead absorption, but a good correlation was obvious. It is concluded that the ALA determination of urinary lead is an effective method of determining lead absorption. (Jerome - Vanderbilt)
W73-11309

PHOSPHORUS REMOVAL, A BIBLIOGRAPHY, VOLUME I.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11319

PHOSPHORUS REMOVAL, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11320

IMPAIRMENT OF THE FLAVOR OF FISH BY WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
D. L. Shumway, and J. R. Palensky.
Copy available from GPO Sup Doc as EP1.23:73-010, $1.25; microfiche from NTIS as PB-221 480, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-010, February 1973. 80 p, 9 fig, 12 tab, 15 ref. EPA Project 18050 DDM.

Descriptors: *Fish, *Taste, *Organic compounds, *Pulp wastes, *Sewage effluents, Water pollution, Water quality, *Organoleptic properties, Trout, Bass, Bluegill, Odor.
Identifiers: *Organoleptic evaluation, Laboratory study.

Laboratory studies were conducted with fish to determine an appropriate bio-assay procedure for the examination of the flavor-imparting capacity of wastes and waste components (organic compounds). In addition, the flavor-imparting capacity and estimated threshold concentrations were determined for a number of organic compounds and effluents. Flavor evaluations were obtained through the use of taste panels. Estimated threshold concentrations were determined for twenty two organic compounds. The values ranged from 0.4 ppb (2,4-dichlorophenol) to 95 ppm (formaldehyde). An additional twelve compounds were tested, seven of which were not found to impair flavor at or near lethal levels. Estimated threshold concentrations were determined for effluents from the Corvallis Sewage Treatment Plant, kraft paper mills, and a sulfite-base paper mill. The estimated threshold concentrations for primary, secondary, and secondary chlorinated effluents from the Corvallis plant were determined to be 11-13, 21-23, and 20-26 percent by volume, respectively. The estimated threshold concentrations for the effluents from the kraft and sulfite-base paper mills were about 6 and 36 percent by volume, respectively. (EPA)
W73-11322

ENVIRONMENTAL EFFECTS ON TOXAPHENE TOXICITY TO SELECTED FISHES AND CRUSTACEANS,
Aquatic Sciences, Inc., Boca Raton, Fla.
W. R. Courtenay, Jr., and M. H. Roberts, Jr.
Copy available from GPO Sup Doc as EP1.23:73-035, $1.00; microfiche from NTIS as PB-221 481, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-035, April 1973. 73 p. EPA Project 18080 DLR, Contract 14-12-532.

Descriptors: *Pesticide toxicity, *Chlorinated hydrocarbons, *Salinity, *Temperature, *Dissolved oxygen, Bass, Mullets, Crabs, Pink shrimp, Path of pollutants, Larvae, Juvenile fish, *Lethal limit, *Crustaceans, Toxicity.
Identifiers: *Toxaphene salinity, Synergism, Micropterus salmoides, Mugil cephalus, Mugil cerema, Trachinotus carolinus, Callinectes sapidus, Panaeus duorarum, Sesarma cinereum, Rhithropanopeus harrisii, Zoea, Megalopa, Mysis, Protozoea, Nauplius.

Laboratory studies were conducted to determine lethal limits (96 hr TL50) for Toxaphene, salinity, temperature, and dissolved oxygen and their interaction effects on developmental stages of selected warm-temperate and subtropical fishes and crustaceans. Species tested were Micropterus salmoides (Largemouth bass), Mugil cephalus (striped mullet), Mugil curema (silver mullet), Trachinotus carolinus (pompano), Callinectes sapidus (blue crab), Penacus duorarum (pink shrimp), Sesarma cinereum (drift line crab), and Rhithropanopeus harrisii (mud crab). Histopathological and gross morphological studies were conducted on all early life history stages of the species included. Earliest developmental stages of the fish species treated are more resistant to high levels of salinity, and to low levels of dissolved oxygen, but more sensitive to high temperatures than are later stages. Decapod larvae showed increasing tolerance to Toxaphene with increasing developmental age. Synergistic effects between Toxaphene and the three environmental factors were suggested in the species tested. Some histopathology was noted in fry of bass and mullet, and in larvae of S. cinereum, C. sapidus, and R. harrisii. (EPA)
W73-11323

DEVELOPMENT OF DISSOLVED OXYGEN CRITERIA FOR FRESHWATER FISH,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
C. E. Warren, P. Doudoroff, and D. L. Shumway.
Copy available from GPO Sup Doc as EP1.23:73-019, $2.10; microfiche from NTIS as PB-221 513, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-019, February 1973. 121 p. EPA Project 18050 DJZ.

Descriptors: *Oxygen requirements, *Fish, Fish growth, Fish respiration, Fish reproduction, Salmon, Trout, Bass, Pollution (Water), Aquatic productivity, Water quality, *Dissolved oxygen, Water pollution effects.
Identifiers: *Pacific salmon, *Steelhead trout, *Largemouth bass, Laboratory studies.

Research has involved laboratory studies on the survival, development, bioenergentic and growth, swimming performance, and avoidance behavior of chinook and coho salmon, steelhead trout, and largemouth bass. Some studies have been conducted under very simple laboratory conditions, as in aquaria or other apparatus, but some studies on bioenergetics and growth have also been conducted under rather natural conditions in laboratory streams and ponds. In some important cases, close correspondence was found between the effects of reduced oxygen concentration in aquarium studies of growth at maximum rations and its effects under more natural conditions in laboratory streams and ponds. Some of the biological responses of the fish studies were affected by any appreciable reduction in dissolved oxygen below the air saturation levels, whereas others were affected only at levels below about 50 percent the air saturation levels. (EPA)
W73-11327

LIMNOLOGY OF YELLOWTAIL RESERVOIR AND THE BIG HORN RIVER,
Montana State Univ., Bozeman.
J. C. Wright, and R. A. Soltero.
Copy available from GPO Sup Doc as EP1.23:75-002, $1.25; microfiche from NTIS as PB-221 487, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-002, February 1973. 105 p, 32 fig, 19 tab, 83 ref. EPA Project 18050 DBW.

Descriptors: Water chemistry, *Impounded waters, *Light penetration, *Primary production, *Phytoplankton, *Withdrawal, Density stratification, Thermal stratification, Turbidity currents, Ammonia, Nitrates, Nitrites, Phosphates, Trace elements, Turbidity, *Montana, *Wyoming, Reservoir releases.
Identifiers: *Bighorn Lake.

Impoundment and deep water withdrawal displaced the maximum and minimum temperatures and conductivities of the effluent two to four months behind the influent occurrence and greatly reduced the amplitude of seasonal change. Of the influent total carbon, nitrogen and phosphate, 24%, 25% and 86% respectively were retained in the reservoir. The major fraction retained was the particulate portion. A significant correlation was found between total phosphate, orthophosphate and turbidity. Nitrate, ortho-phosphate and trace metals were in higher concentration in the upper end of the reservoir associated with turbid water. A withdrawal caused density current was evident which altered the vertical and longitudinal distribution of physical and chemical parameters. Volume based phytoplankton density and chlorophyll concentration decreased down-reservoir. However, the depth of the euphotic zone increased down-reservoir as silt settled out. Consequently the euphotic zone standing crops were greatest in the mid-section of the reservoir. Insufficient light penetration was the principal limiting factor to primary production in the upper end of the reservoir. Decreased primary productivity in the lower end of the reservoir did not appear to be due to nutrient limitation. (EPA)
W73-11331

FISH AND FOOD ORGANISMS IN ACID MINE WATERS OF PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Biology.
R. L. Butler, E. L. Cooper, D. C. Hales, C. C. Wagner, and W. G. Kimmel.
Copy available from GPO Sup Doc as EP1.23:73-032, $2.10; microfiche from NTIS as PB-221 515, $0.95. NTIS PC$4.60. Environmental Protection Agency report number, EPA-R3-73-032, February 1973. 158 p, 41 fig, 28 tab, 76 ref. EPA Project 18050 DOG.

Descriptors: *Water pollution effects, *Acid mine water, *Bioassay, Water quality, *Fish behavior, Distribution patterns, Acidity, Invertebrates, *Pennsylvania, Mine drainage, *Aquatic insects, Lethal limit, Toxicity.

Objectives were: (1) develop a rapid and non-lethal bioassay for acid water using changes in utilization of cover and activity of fish, (2) determine the effect of different levels of acid mine drainage on the presence of absence or fish populations in the watersheds of Pennsylvania, (3) determine the median tolerance limits to low levels of pH of five aquatic insects chosen on the basis of their wide occurrence and common association in soft-water streams. Analysis of variance revealed there was no relationship between cover utilization and pH levels or between activity and pH levels for four species of fish (smallmouth bass, longnose dace, rock bass and brook trout). In part II of the project it was found that common fish species normally distributed over several watersheds were absent where there was severe acid mine drainage. Of the 116 species of fishes found 10 species exhibited some tolerance to acid mine drainage (values of pH 5.5 or less). In part III all aquatic species survived exposure for four days to pH levels from 6.5 to 4.0. The 96-hour TLM values ranged from 3.31 for the most sensitive animal, Stenonema sp., to 1.72 for the most tolerant insect, Nigronia fasciata. (EPA)
W73-11332

RESEARCH AND THE PROBLEMS OF TWO SEAS,
For primary bibliographic entry see Field 02L.
W73-11350

SOME THERMAL CONSEQUENCES OF ENVIRONMENTAL MANIPULATIONS OF WATER,
Texas Univ., Austin. Dept. of Zoology.
C. Hubbs.
Biol Conserv. Vol 4, No 3, p 185-188. 1972.

Identifiers: Biota, *Environmental effects, Manipulations, *Thermal pollution, Water pollution effects.

Environmental manipulations can alter thermal regimes, upset the delicate adaptations of natural populations, and have adverse effects on the native biota. The resulting problems can be exacerbated by reducing 24-hourly oscillations, increasing potentiality for thermal shock, and causing reproduction to occur at adverse temperatures.--Copyright 1972, Biological Abstracts, Inc.
W73-11355

MERCURY--A CASE STUDY OF MARINE POLLUTION,
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
For primary bibliographic entry see Field 05B.
W73-11375

A FEW COASTAL POLLUTION PROBLEMS IN JAPAN,
Tokyo Univ. (Japan). Dept. of Urban and Sanitary Engineering.
J. Ui.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 171-176, 1972. 1 fig, 1 tab, 7 ref.

Descriptors: *Coasts, Water pollution effects, Pollutants, *Mercury, *Cadmium, *Polychlorinated biphenyls, Diseases, Fish, Food chains, *Human diseases, Toxicity.
Identifiers: *Japan, *Minamata disease, *Itai-itai disease.

Mercury (Hg) compounds have been widely used in various fields of industry, as well as a fungicide in rice fields and have produced the first case of actual danger to human health from industrial activities. The disease, produced by ingestion of contaminated fish, has been called Minamata Disease and is associated with methyl-Hg. The magnitude of accumulation of Hg in fish and other biomass could be influenced by the ratio of Hg input and the quantity of existing organic material or the rate of primary production in that region. Cadmium has been found to produce another strange disease called 'Itai-itai,' with pain and fracture in bones, but in this case there is no evidence of the formation of an organo-metallic compound of Cd, such as the one for Hg. PCB is another compound with a strong persistence and a strong accumulation tendency that is considered a potential health hazard. (See also W73-11367) (Ensign-PAI)
W73-11376

FACTORS CONTROLLING MARINE ECOSYSTEMS,
Marine Lab., Aberdeen (Scotland).
J. H. Steele.
In: The Changing Chemistry of the Oceans; Proceedings of the 20th Nobel Symposium, August 16-20, 1971, Goteborg, Sweden: Wiley Interscience Division of John Wiley and Sons, Inc., p 209-221, 1972. 5 fig, 20 ref, append.

Descriptors: *Marine biology, *Ecosystems, *Food chains, Primary productivity, Productivity, Fish, Path of pollutants, Comparative productivity, Food pyramids, Trophic level, Carnivores, Herbivores.
Identifiers: *Marine ecosystems.

In the sea probably 90% or more of the plant production is eaten by herbivorous zooplankton and the fallout of organic matter to the sea below the euphotic zone is largely faecal material. In consequence the phytoplankton biomass is of the same order of magnitude as the herbivores. Less than 10% of plant material on land is eaten while living, and nearly all enters the decomposer cycle. For this reason vegetation normally dominates the biomass. These very different patterns of energy flow have obvious consequence for the passage of pollutants through the food chains, particularly the accumulation of persistent toxins at higher trophic levels in the marine system. Significant changes are most likely to arise when the organisms affected have a major role in controlling other groups or trophic levels. Theories of control of terrestrial ecosystems do not appear adequate as a basis for considering effects on marine systems. Under normal conditions in the sea nearly all the energy produced by phytoplankton passes through the zooplankton before it enters higher trophic levels. The feeding patterns of copepods are probably a critical factor in maintaining this close control. The rate of predation by carnivores may be determined more by efficiency of energy conversion than as a general controlling factor and so, although large changes would obviously alter the system, smaller disturbances are more likely to affect us through our commercial harvest of predators. (See also W73-11367) (Knapp-USGS)
W73-11380

THE ACCELERATION OF THE HYDROGEOCHEMICAL CYCLING OF PHOSPHORUS,
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 05B.
W73-11385

PRESERVATION OF LAKE BAYKAL (OB OKHRANE OZERA BAYKAL),
Hydrometeorological Service of the USSR, Moscow.
Yu. A. Izrael', and A. A. Zenin.
Meteorologiya i Gidrologiya, No 1, p 15-19, January 1973.

Descriptors: *Lakes, *Water conservation, Waste water treatment, Waste water disposal, Waste water (Pollution), Environmental sanitation, Water purification, Water quality control, Industrial wastes, Effluents, On-site investigations, *Water quality standards.
Identifiers: *USSR, *Lake Baykal.

The present state of Lake Baykal and measures to protect it during intense economic development in the lake basin are described. Data are presented on the effects of treated waste water from the Baykal'sk cellulose plant on the water quality and life cycle of the lake. Studies are currently underway at scientific institutions to determine the effect of human activity on chemical, hydrologic, and hydrobiologic regimes of the lake and to establish discharge-water standards for dumping pollutants into bodies of water. (Josefson-USGS)
W73-11407

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE,
Worcester Polytechnic Inst., Mass.
K. Keshavan, and G. C. Sornberger.
Available from the National Technical Information Service as PB-221 533, $3.00 in paper copy, $0.95 in microfiche. Massachusetts Water Resources Research Center, Amherst, Final Technical Report, 1973, 35 p. OWRR C-3027 (3674).

Descriptors: *Dissolved oxygen, *Model studies, Oxygen sag, *Thermal pollution, Reaeration, Temperature gradient, Dispersion, Temperature.
Identifiers: *Oxygen Sag Curve, *Organic pollution.

A deterministic model is developed for the oxygen sag curve for a variable temperature condition under thermal overload. With the help of the above model, optimal locations of thermal and organic outlets with respect to each other can be determined for a predetermined minimum dissolved oxygen concentration in the river.
W73-11423

THE RELATIONSHIP OF ENZYME KINETIC HETEROTROPHY ANALYSIS TO OTHER EUTROPHICATION INDICES,
Utah State Univ., Logan. Dept. of Wildlife Science.
D. D. Koob.
Available from the National Technical Information Service as PB-221 540, $3.00 in paper copy, $0.95 in microfiche. Research Report 11, June 1973. Utah agricultural Experiment Station, Utah State University. 14 p, 8 fig, 32 ref. OWRR A-013 UTAH (1).

Descriptors: *Primary productivity, Oligotrophy, *Eutrophication, Coliforms, *Utah, Kinetics.
Identifiers: Dark uptake, Inorganic carbon, Bear Lake (Utah), *Enzyme kinetics, *Heterotrophy analysis.

Three locations in Bear Lake, an ultraoligotrophic lake on the Utah-Idaho border, were sampled for five eutrophication indicators - primary productivity, total bacterial concentrations, coliform concentrations, Vt values, and dark uptake rates for inorganic carbon. In general, samples from the northern and central water gyres of the lake were similar, but different from samples from the southern gyre. No numerically significant correlations were found between any tow of the parameters tested, although similar weekly patterns of change were noted for dark uptake of inorganic carbon and Vt values at two of the locations. Highest rates of carbon fixation (both photosynthetic and nonphotosynthetic) and of organic carbon uptake occurred at the location nearest concentrated human occupation. High values for coliform counts, Vt values, and primary productivity occurred during periods of high tourist activity. A stimulatory influence of Swan Creek inflow on primary productivity was indicated.
W73-11432

EFFECTS OF LOGGING ON GROWTH OF JUVENILE COHO SALMON,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
P. M. Iwanago, and J. D. Hall.
Copy available from GPO Sup Doc as EP1.23:73-006, $0.75; microfiche from NTIS as PB-221 541, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-006, April 1973. 35 p. EPA Project 18050 FKT.

Descriptors: *Salmon, *Growth rates, *Thermal stress, *Lumbering, Clear-cutting, Fish, Fish parasites, *Oregon, Water temperature, Pacific Northwest U. S., Juvenile fish.
Identifiers: *Coho salmon (Juvenile).

The objective was to study the effects of increased water temperature characteristic of clearcut watersheds of Pacific coastal streams upon the growth rate of juvenile coho salmon. The natural temperature fluctuations of the stream were used in the study of growth of underyearling fish held in aquariums and fed at various consumption levels. Juvenile coho fed in the control stream grew somewhat faster than did those that experienced the warmer temperatures of the clearcut stream. This was particularly true at low levels of consumption. Growth rates of juvenile coho salmon in the wild state were found to be slightly higher in the clearcut stream as compared to the unlogged stream. This difference from the experimental results may have been due to a change in availability and abundance of food. There was a marked decrease in the cutthroat trout population in the

clearcut stream, which may have reduced competition for food. There was no apparent influence of infestation by salmon poisoning fluke on the condition of the juvenile coho in the clearcut stream. (EPA)
W73-11433

STANDARD DISPERSANT EFFECTIVENESS AND TOXICITY TESTS,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 05A.
W73-11442

THE EFFECTS OF TEMPERATURE ON GROWTH AND REPRODUCTION OF AQUATIC SNAILS,
Michigan Univ., Ann Arbor. Museum of Zoology.
H. van der Schalie, and E. G. Berry.
Copy available from GPO Sup Doc as EP1.23:73-021, $2.35; microfiche from NTIS as PB-221 549, $0.95. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-021, February 1973. 164 p, 58 fig, 20 tab, 99 ref. EPA Project 18050 FOG.

Descriptors: Aquatic animals, *Snails, *Thermal pollution, *Growth, *Reproduction, Water pollution effects, Temperature.
Identifiers: *Operculate snails, *Pulmonate snails.

The effects of temperature on the following freshwater snails were studied: Lymnaea stagnalis, L. emarginata, Helisoma trivolvis, H. anceps, H. campanulatum and Physa gyrina - all pulmonate 'pond' snails; one gill-breathing operculate (Amnicola limosa) was also tested. Both growth and egg-laying were measured in temperatures ranging from 6 to 36C. Gonad development was determined through serial paraffin sections; reproduction was measured in terms of egg-laying. The lymnaeids grow best at 18C; egg production is better at 22C. Incontrast, the planorbids grow better under warmer conditions (about 25C); however, when 30C is reached growth may appear better but reproduction is inhibited. The physids tolerate the widest range, sometimes conditions warmer than 30C, although at this temperature reproduction is also inhibited. The one operculate, Amnicola limosa, studied had a preference for cool conditions; i.e., it was like the lymnaeids in temperature responses. The groups varied in response to temperature as indicated, but none could be cultured much below 12C and none would reproduce at temperatures above 30C. Mollusks are very sensitive to ambient temperatures; even small changes are important in their influence on the environmental area affected. Studies are encouraged to determine the effects of temperature changes well in advance of projected developments. (EPA)
W73-11444

ORGANIC LOADING OF PETENWELL RESERVOIR, WISCONSIN,
Wisconsin Univ., Madison.
J. W. Kluesener, and G. F. Lee.
Journal of Water Pollution Control Federation, Vol 45, No 2, p 269-282, February 1973. 8 fig, 4 tab, 18 ref.

Descriptors: *Dissolved oxygen, *Organic loading, *Pulp wastes, *Ice cover, Biochemical oxygen demand, Water pollution, Pulp and paper industry, Chemical analysis, Water analysis, Organic wastes, Water pollution effects, Water pollution sources, Reaeration, Wisconsin, Flow, Photosynthesis, Water sampling, River flow, Rivers, Absorption, Sediments, Nutrients, Air-water interfaces, Organic matter.
Identifiers: *Petenwell Reservoir, Wisconsin River, Reaeration coefficients, Nekoosa Dam.

Studies were conducted on the Wisconsin River from Nekoosa, Wisconsin, to the Petenwell Reservoir to determine organic loading to and conditions in the Petenwell Reservoir specifically during the winter period of ice cover. Determinations made using 20 sampling sites include: flow, DO, BOD, nitrogen, phosphorus, photosynthesis, and sedimentary oxygen uptake. Stream profile studies were conducted at 3 sites. The river in this area had large excesses of biodegradable materials, chiefly from pulp and paper mills, compared to the oxygen available during the periods of late summer and winter ice cover. Reaeration and photosynthesis were not sufficient to overcome the oxygen deficit. Frequently, dissolved oxygen concentrations near zero were obtained in the Wisconsin River between Nekoosa and the Petenwell flowage. In the winter under ice cover, approximately 360,000 lb (163,000 kg) of BOD entered Petenwell flowage in excess of available oxygen. This resulted in large parts of the flowage having essentially zero dissolved oxygen. The primary source of oxygen-demanding materials was the organic matter dissolved and suspended in the water. The sludge deposits and natural lake sediments were estimated to have a minor effect on the oxygen concentrations in the water. (Holoman-Battelle)
W73-11486

REPORT ON EVALUATIONS OF WASTE SOURCES IN THE CALCASIEU RIVER BASIN, LOUISIANA.
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-11529

HANDBOOK OF TOXIC CHEMICALS (SECOND EDITION, REVISED AND SUPPLEMENTED0,
O. N. Prokof'yev.
Available from NTIS, Springfield, Va., 22151 as AD-746 649, Price $8.50 printed copy; $0.95 microfiche. Army Materiel Command Foreign Science and Technology Center Technical Translation Report FSTC-HT-23-1069-72, 1972. 125 p, 21 ref, append. (Translation of Spravochnik po yadokhimikatam izdaniye vtoroye, ispravlennoye i dopolnennoye; 'Kaynar' Press, Alma-Ata, 1968.)

Descriptors: *Toxins, *Chemicals, *Pesticides, *Herbicides, Environmental effects, Chemical properties, Water pollution sources, Reviews, Evaluation, Toxicity, Agricultural chemicals, Plant growth regulators, Soil contamination effects.
Identifiers: *Toxic chemicals handbook.

This handbook gives agricultural specialists necessary information on various toxic chemicals and methods for their use. Toxic chemicals and herbicides are described in alphabetical order according to groups of preparations. In employing resources for plant protection, it is important to select that preparation which will insure the greatest effect for the least expense in labor and resources. It is necessary to know the physicochemical and toxicological properties of toxic chemicals and herbicides, as well as the biological characteristics of treated crops, pests, diseases, and weeds. (Woodard-USGS)
W73-11554

MERCURY, DDT, AND PCB IN HARBOUR SEALS (PHOCA VITULINA) FROM THE BAY OF FUNDY AND GULF OF MAINE,
Guelph Univ. (Ontario). Dept. of Zoology.
D. E. Gaskin, R. Frank, M. Holdrinet, K. Ishida, and C. J. Walton.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 471-475, March 1973. 2 tab, 7 ref.

Descriptors: *Mercury, *DDT, *Polychlorinated biphenyls, *Dieldrin, *Pollutant identification, Marine anaimals, Mammals, Maine, Canada, Gas chromatography, Sea water, Chlorinated hydrocarbon pesticides, Heavy metals, Solvent extractions, Insecticides, Separation techniques.
Identifiers: *Phoca vitulina, Gulf of Maine, Bay of Fundy, Harbor seals, Sample preparation, Animal tissues, Atomic absorption, Seals (Animals), Liver, Phocoena phocoena, Muscle, Blubber, Adipose tissue, Cerebrum, Brain, Spectrophotometry, Harbor porpoises, Porpoises, Fat tissue.

Samples of blubber, longissimus muscle, liver and cerebrum from 12 harbour seals (Phoca vitulina) were analyzed for DDT, dieldrin, PCBs, and total mercury content. Analysis for total mercury was as previously described by Gaskin et al. (1972), whereby elemental Hg was released and read as a cold vapor at 253.7 nm with an AA-5 Techtron atomic absorption spectrophotometer. For organochlorine compound estimation macerated samples were subjected to exhaustive soxhlet fat extraction with hexane, cleaned on a florisil column and eluted with 20 percent dichloromethane in hexane. An aliquot was dissolved in hexane after preliminary GC analysis and introduced to an activated coconut charcoal column to separate the DDT group from PCBs. The DDT group was eluted with 25 percent acetone in ether, the PCBs with benzene, and both fractions passed through a mixed phase column for residue qualification and quantitation by GC. The results were compared with those obtained previously for harbour porpoises (Phocoena phocoena). DDT and PCB levels appear to be of the same magnitude in the fat of seals from both southern New Brunswick and southern Maine, being lowest in a lactating female. Virtually no o, p'-DDT and relatively little dieldrin were found in seal fat, in contrast to porpoises, which contained significant amounts of both in the depot fat. Mercury levels were generally similar to those found for porpoises, but total liver Hg was considerably greater in adults from the New Brunswick islands than in those from the southern Maine ledges. (Holoman-Battelle)
W73-11577

RESIDUES OF CHLORINATED HYDROCARBON PESTICIDES IN THE NORTHERN QUAHOG (HARD-SHELL CLAM), MERCENARIA MERCENARIA-1968 AND 1969,
Rhode Island Dept. of Health, Providence. Div. of Labs.
R. M. Check, and M. T. Canario, Jr.
Pesticides Monitoring Journal, Vol 6, No 3, p 229-230, December 1972. 1 fig, 1 tab, 3 ref.

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Pollutant identification, Clams, Chemical analysis, Sampling, Rhode Island, DDT, DDD, DDE, Dieldrin, Solvent extractions, Shellfish, Marine animals, Mollusks, Invertebrates.
Identifiers: *Mercenaria mercenaria, Northern quahog, Macroinvertebrates, Animal tissues, Thin layer chromatography, ELectron capture gas chromatography, Sample preparation, Mount Hope Bay, Narragansett Bay, p p' DDD, Isomers, p p' DDE, p p' DDT, o p' DDE, Detection limits.

Samples of the northern quahog (Hard-shell clam), Mercenaria mercenaira, were collected monthly, when possible, from September 1968 to September 1969 at five locations in Narragansett Bay, Rhode Island, and one location in nearby Mount Hope Bay. The clams were shucked and drained; a 300-g composite sample of meat (14-18 clams from each location) was blended until homogenized, and frozen until analysis by electron capture gas chromatography. All pesticides residues found were confirmed by thin layer chromatography using precoated aluminum oxide G plates. All 56 composite samples contained dieldrin at an average level of 0.040 ppm; p, p'-DDD was present in three samples at an average level of 0.026 ppm. Quahogs from upper reaches of Narragansett Bay contained

higher levels of residues than samples from lower Bay areas. (Holoman-Battelle)
W73-11579

DDT, DDE, AND POLYCHLORINATED BIPHENYLS IN BIOTA FROM THE GULF OF MEXICO AND CARIBBEAN SEA--1971,
Texas A and M Univ., College Station. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-11580

PROGRESS REPORT ON WATER QUALITY OF LAKE MICHIGAN NEAR CHICAGO,
Chicago Dept. of Water and Sewers, Ill.
For primary bibliographic entry see Field 05B.
W73-11581

EFFECTS OF LOGGING ON PERIPHYTON IN COASTAL STREAMS OF OREGON,
New Mexico Univ., Albuquerque. Dept. of Biology.
E. W. Hansmann, and H. K. Phinney.
Ecology, Vol 54, No 1, p 194-199, Winter 1973. 3 fig, 1 tab, 9 ref.

Descriptors: *Water pollution effects, *Lumbering, *Oregon, *Streams, *Chlorophyta, *Cyanophyta, *Dissolved oxygen, *Water temperature, *Sediment load, *Chrysophyta, Dominant organisms, Periphyton, Diatoms, Sediments, Sampling, Chlamydomonas, Phytoplankton, Anabaena, Biological communities, Artificial substrates.
Identifiers: Deer Creek (Oregon), Flynn Creek (Oregon), Needle Branch (Oregon), Sphaerotilus natans, Draparnaldia glomerata, Spirogyra gravilleana, Tetraspora, Anabaena affinis, Oscillatoria amphibia, Diatoma hiemale, Synedra rumpens, Achananthes minutissima, Nitzschia palea, Eunotia arcus, Cocconeis placentula, Achnanthes lanceolata.

Changes in the stream algal flora were observed during a multi-disciplinary logging study of small watersheds in Oregon. Clearcut logging was applied to one watershed of 71 hectares, while a second watershed of 304 ha was patch-cut leaving a buffer-strip of vegetation along the stream channel. A third watershed of 203 ha was not logged but remained as a control. Pre-logging and post-logging oxygen levels, temperature, and sedimentation loads were analyzed. Access roads were built in 1963, and logging completed in 1966. Analysis of the algal communities of the three watershed streams prior to the logging operation of 1966 indicated that the communities were predominantly a periphyton type composed mainly of diatoms. Immediately following the yarding operation of the clearcut watershed, large quantities of Sphaerotilus natans colonized all debris and mud in the stream, and a change in the algal flora appeared to take place. Large mats of green algae were observed colonizing all mud and slash. Results from glass substrates indicate that some changes may have taken place in the diatom community. (Little-Battelle)
W73-11582

MERCURY IN HARBOUR PORPOISES (PHOCOENA PHOCOENA) FROM THE BAY OF FUNDY REGION,
Guelph Univ. (Ontario). Dept. of Zoology.
D. E. Gaskin, K. Ishida, and R. Frank.
Journal of the Fisheries Research Board of Canada, Vol 29, No 11, p 1644-1646, November 1972. 2 fig, 10 ref.

Descriptors: *Mercury, *Chemical analysis, *Pollutant identification, Heavy metals, Mammals, Marine animals, Methodology.
Identifiers: *Harbor porpoises, *Phocoena phocoena, *Animal tissues, *Cold vapor atomic absorption spectrophotometry, Bay of Fundy, Liver, Muscle, Sample preparation.

During 1969-1971, 41 muscle and 20 liver samples were collected from harbour porpoises (Phocoena phocoena) in the Bay of Fundy region. These tissues were analyzed for total mercury content by cold vapor AAS. Total Hg levels ranged from 0.21 to 1.92 ppm (average 0.75) in muscle tissue of males and from 0.26 to 2.58 ppm (average 1.02) in muscle tissue of females; from 0.89 to 18.30 ppm in liver tissue of males and from 0.55 to 91.30 ppm in liver tissue of females. Averages for the two latter series would be meaningless. A limited number (four muscle and six liver samples) of determinations of the methylated fraction were also made. In the muscle, Hg was virtually 100 percent methylated; in the liver the methylated fraction varied from 7.4 to 41 percent, being lowest in livers with highest total Hg. (Holoman-Battelle)
W73-11588

ACUTE AND LONG-TERM ACCUMULATION OF COPPER BY THE BROWN BULLHEAD, ICTALURUS NEBULOSUS,
National Water Quality Lab., Duluth, Minn.
W. A. Brungs, E. N. Leonard, and J. M. McKim.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 583-586, April 1973. 4 tab, 11 ref.

Descriptors: *Bioassay, *Copper, Heavy metals, Toxicity, Water pollution effects.
Identifiers: *Brown bullhead, *Ictalurus nebulosus, Biological samples, Gills, Opercle, Liver, Kidney, Blood, Bioaccumulation.

A study was conducted to determine the acute and long-term toxicity and accumulation of copper by the brown bullhead (Ictalurus nebulosus) and to investigate the use of copper residues as a possible autopsy procedure. In addition, an attempt was made to collect some initial information on the transport, distribution, and accumulation rate of copper in fish. The fish were exposed to constant concentrations of copper ranging from 6.5 to 422 micrograms/liter. Copper concentrations in gill, opercle, liver, and kidney tissues of live fish did not differ from those that died during the acute exposure. Exposure of fish to sublethal concentrations for 20 days before exposure to lethal concentrations resulted in higher tissue levels in the dead fish than in fish not previously exposed. A distinct increase in liver and gill tissue copper concentrations occurred at exposure levels of 27 micrograms/liter and above. Equilibrium tissue levels of copper in the liver and gill were reached within 30 days. Copper levels in red blood cells and plasma after 20-months exposure did not differ from the controls. Red blood cells analyzed after 6-days and 30-days exposure to copper also showed no increased copper residues. (Little-Battelle)
W73-11593

EFFECT OF CHLORINE ON FLUORESCENT DYES,
California State Dept. of Public Health, Berkeley. Bureau of Sanitary Engineering.
D. G. Deaner.
Journal Water Pollution Control Federation, Vol 45, No 3, p 507-514, March 1973. 9 fig, 2 tab, 3 ref.

Descriptors: *Fluorescent dye, *Chlorine, *Water pollution effects, *Laboratory tests, *Fluorometry, Dye concentrations, Halogens, Fluorescence, Gases, Tracers.
Identifiers: Dissipation rates, Rhodamine WT, Organic dyes, Rhodamine B, Fluorescein, Pontacyl pink B, Chlorine residual.

A study was conducted to determine the effect of chlorine on four widely used fluorescent dyes: fluorescein, rhodamine B, rhodamine WT, and pontacyl pink B. All tests were performed in the laboratory using batch samples contained in 1-l glass bottles. Different dye concentrations were subjected to various chlorine residuals and fluorescence intensities were measured at selected time intervals. Analysis of the results provided the following conclusions: (1) Chlorine has little effect on the fluorescence of the dyes rhodamine B and rhodamine WT at chlorine residuals normally found (2 to 9 mg/l). This conclusion reflects the long-term, steady-state condition when dye and chlorine are mixed instantaneously. In cases where the dye and chlorine are added in close proximity to each other, the loss of dye may vary from that predicted from data obtained in these experiments. (2) At high chlorine residuals, quenching of fluorescence was a result of the effects of chlorine as opposed to the effects of pH change. (3) Dissipation of chlorine residuals followed the equation C equals C sub O minus kt, with k varying between 0.001/min and 0.006/min. (Holoman-Battelle)
W73-11597

A CYPRINODONTID FISH, JORDANELLA FLORIDAE, AS A LABORATORY ANIMAL FOR RAPID CHRONIC BIOASSAYS,
National Water Quality Lab., Duluth, Minn.
W. E. Smith.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 329-330, February 1973. 4 ref.

Descriptors: *Toxicity, *Bioassay, *Laboratory animals, *Laboratory tests, *Water pollution effects, Freshwater fish, Fish reproduction, Killifishes.
Identifiers: *Jordanella floridae, *Flagfish.

The flagfish (Jordanella floridae) is proposed as a useful laboratory fish for chronic toxicity studies. It matures rapidly, reaching breeding age in 6 to 8 weeks under optimum conditions, and the fish will spawn at any time of the year. The adults are sexually dichromatic. A complete chronic test may be conducted with this species in as little as 3 to 4 months. (Holoman-Battelle)
W73-11598

MACROBENTHIC ECOLOGY OF A SAWDUST--BEARING SUBSTRATE IN THE PENOBSCOT RIVER ESTUARY (MAINE),
Maine Univ., Orono. Dept. of Zoology.
W. K. Shorey.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 493-497, April 1973. 3 fig, 2 tab, 9 ref.

Descriptors: *Benthic fauna, *Ecology, *Estuarine environment, Annelids, Mollusks, Crustaceans, Nematodes, Systematics, Benthos, Maine, Estuaries, Invertebrates, Clams, Marine animals, Bottom sampling, Hydrography, Dissolved oxygen, Water temperature, Salinity, Classification, Copepods, Oligochaetes, Amphipoda.
Identifiers: *Penobscot River, *Macroinvertebrates, *Sawdust, Substrates, Echinoderms, Nemerteans, Species abundance, Polychaetes, Macoma balthica, Mya arenaria, Prionospio malmgreni, Corophium volutator, Sample preservation, Pycnogonids, Scolecolepides viridis, Polydora, Mytilus edulis, Heteromastus filiformis, Pygospio elegans, Balanus balanoides, Aglaophamus, Nephtys incisa, Polydora, Gammarus lawrencianus, Phoxocephalus holbolli, Aricidea jeffreysii.

The macrobenthos of sawdust-bearing substrates in the Penobscot River estuary (Maine) were sampled bimonthly from January through November 1968. The polychaete Scolecolepides viridis and the bivalves Macoma balthica and Mya arenaria dominated the sandy sediments of the shallow station. Prionospio malmgreni and Corophium volutator were dominant in the granular substrate of the deeper station. The population of the shallow station (1-m depth, mean low water) was seasonally

more stable and had a higher mean monthly bio-index (number of individuals/number of species) than that of the deeper station (6-m depth, mean low water). (Holoman-Battelle)
W73-11602

THE INFLUENCE OF SIMAZINE ON THE PHOTOSYNTHETIC PIGMENTS OF GREEN ALGAE,
L. N. Paromenskeya, and G. N. Lyalin.
Available from the National Technical Information Service as AD-754 220. Defence Research Information Centre, Orpington, England, Translation No. 2992, DRIC-BR-30358, November 1972. 10 p, 3 fig, 2 tab, 17 ref. Translated from Fiziologiya Rasteniy, Vol 15, No 6, p 1002-1007, 1968.

Descriptors: *Herbicides, *Triazine pesticides, *Water pollution effects, *Plant pigments, Pesticide toxicity, Chlorophyta, Aquatic algae, Chlorinated hydrocarbon pesticides.
Identifiers: *Simazine, *Chlorella vulgaris, *Ankistrodesmus braunii, *Chlorosarcina, Photosynthetic pigments, Luminescence spectra, Lutein, Carotin, Chlorophyll a, Culture media.

The amount of chlorophylls a and b, carotin, lutein and violaxanthin and the chlorophyll luminescence spectra were determined after the incubation for 2, 7 and 17 days of three species of green algae in a medium which either contained or did not contain simazine. The pigment content, and particularly that of lutein, carotin and chlorophyll a, decreased in the cells of the herbicide sensitive species Chlorella vulgaris and Ankistrodesmus braunii. On the basis of the measurement of the chlorophyll luminescence spectra in suspensions of algae, it was deduced that the observable decrease of chlorophyll with sensitive algae is not directly linked to the interaction of the pigment with simazine. In the cells of the resistant species of Chlorosarcina sp, such an interaction takes place even by the second day, which apparently must be one of the reasons for the detoxication of simazine in the cells. (Holoman-Battelle)
W73-11610

A STUDY OF A SMALL TROPICAL LAKE TREATED WITH THE MOLLUSCICIDE FRESCON,
Westfield Coll., London (England).
S. A. Corbet, J. Green, and E. Betney.
Environmental Pollution, Vol 4, No 3, p 193-206, April 1973. 2 fig, 8 tab, 10 ref.

Descriptors: *Pesticide toxicity, *Freshwater fish, *Molluscicides, *Invertebrates, Snails, Rotifers, Diptera, Dragonflies, Mayflies, Oligochaetes, Mites, Nematodes, Water pollution effects, Lakes, Fishkill, Mollusks, Cyanophyta, Zooplankton, Aquatic insects, Water beetles, Benthic fauna, Shrimp, Aquatic weeds, Midges.
Identifiers: *Frescon, N-tritylmorpholine, Lake Kotto, Barombi Moo, West Cameroon, Beetles, Macroinvertebrates, Microcystis, Thermocyclops hyalinus, Chaoborus ceratopogones, Nepa, Chironomids, Hemiptera, Water mites, Ostracods, Hemichromis fasciatus, Stentor, Chromidotilapia guntheri loennbergi, Tilapia spp, Sarotherodon galilaeus, Barbus callipterus, Clarias walkeri, Trithemous, Ictinogomphus, Povilla adusta, Ranatra, Najas pectinatus, Cardinia africana.

N-tritylmorpholine was applied, as the 16.5 percent w/v emulsifiable concentrate in tetrachloroethylene, to parts of the shores of two lakes in West Cameroon against the vectors of schistosomiasis. The concentrations of N-tritylmorpholine, with its breakdown product, triphenylcarbinol, in the lakes just after spraying ranged from 0.9 to 8.0 ppm. The treatment killed many cichlid fishes, particularly the young that live close inshore, and the higher concentrations killed or immobilized several species of aquatic insects, crustaceans and rotifers. Ostracods and hydracarines survived 4.8 ppm. There were no obvious long-term effects on the populations of fishes or invertebrates, probably because these animals quickly recolonize the treated beaches from unsprayed areas nearby. The use of an alternative, granular, formulation of N-tritylmorpholine may prove less harmful to fishes and invertebrates other than snails. (Little-Battelle)
W73-11614

SUBLETHAL EFFECTS OF BLEACHED KRAFT PULP MILL EFFLUENT ON RESPIRATION AND CIRCULATION IN SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 369-377, March 1973. 6 fig, 1 tab, 31 ref.

Descriptors: *Pulp wastes, *Toxicity, *Bioassay, *Respiration, *Water pollution, Effects, Fish physiology, Industrial wastes, Salmon, Lethal limit, Rainbow trout, Fish, Oxygen, Absorption, Pulp and paper industry.
Identifiers: *Oncorhynchus nerka, *Circulation (Blood), *Bleached kraft mill effluent, Median tolerance limit, Sockeye salmon, Gills, Kraft pulp mill, Ventilatory volume, Cough frequency, Oxygen utilization, Pollutant effects.

Sublethal effects of aerated neutralized, filtered, full-bleach kraft mill effluent (BKME) on circulation and respiration of Pacific salmon were examined. Samples of the effluent were collected every 7-10 days from the alkaline waste sewer and sampling valves in the mill. Caustic extraction effluent was sampled along with the alkaline waste. All samples were stored, unmixed at 2C for up to 10 days. Composite samples approximating the composition of the waste discharged into the sea were tested for toxicity using 4-day static bioassay procedures (Sprague, 1969). Ventilatory water flow, oxygen, uptake, cough frequency, and buccal pressure increased in a group of 19 sockeye salmon, Oncorhynchus nerka, 207-321 g, at 10.5 plus or minus 0.5C, upon initial exposure to sublethal BKME concentrations. The threshold concentration for these responses appeared to be around 20 percent of the 4 day LC50 (static bioassay). Following overnight exposure to BKME, ventilatory volume oxygen uptake rate, cough frequency, and oxygen utilization tended to approach pre-exposure levels, particularly at the higher sublethal concentrations. Changing effluent toxicity, acclimation phenomena, or physiological adjustment are discussed as possible explanations for these results. Measures of arterial oxygen tension in sockeye salmon indicated that arterial tension declines rapidly and remains depressed following up to 24 hr exposure to BKME (33-47 percent of 4 day LC50). On the average this decline represented a 20 percent decrease in oxygen saturation of the blood. Decreased arterial PO2 may be due to mucous production at the gills and resulting gas diffusion problems, as well as abnormalities in ventilation. Reduction in scope for activity might result from impaired oxygen uptake at the gills. A similar response was observed in rainbow trout, Salmo gairdneri. (Holoman-Battelle)
W73-11615

COPPER INDUCED LESIONS IN ESTUARINE TELEOSTS,
National Marine Water Quality Lab., West Kingston, R.I.
G. R. Gardner, and G. LaRoche.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 363-368, March 1973. 4 fig, 1 tab, 24 ref.

Descriptors: *Copper, *Toxicity, *Growth stages, *Bioassay, Fish diseases, Fish eggs, Juvenile fish, Larvae, Mature growth stage, Laboratory tests, Killifishes, Saline water fish, Heavy metals, Marine fish, Silversides, Cytological studies.
Identifiers: *Menidia menidia, *Fundulus heteroclitus, *Histopathology, Atlantic silverside, Mummichogs, Animal tissues, Sample preparation, Brain, Connective tissue, Olfactory organs.

The advanced fry, zygotes and adults of the mummichog, Fundulus heteroclitus, and adult Atlantic silversides, Menidia menidia, were exposed to Cu in seawater. Adult Fundulus were also exposed by means of intraperitoneal injection. The inital copper concentrations to which adult (both species) and fry were exposed in their aquatic media were 0.0, 0.5, 1.0, and 5.0 mg/liter. In the portions of the study employing external exposures, the metal was added to the media following the introduction of fish. The exposure of zygotes was at concentrations of 0.0, 0.25, 0.5, 1.0, 3.0, 5.0, and 10.0 mg/liter. The intraperitoneal injections were given to adults at concentrations of 0.0, 0.5, 1.0, 10.0, 20.0, and 100.0 mg/liter in a 0.05 ml volume of 0.7 percent saline. Cellular changes attributable to copper were observed in the mechanoreceptors of the lateral line canals in the head of adult mummichog and Atlantic silverside. The epithelium of these canals was also altered in F. heteroclitus. In both species, lesions were observed in the olfactory organs, which included the chemoreceptive sites. These manifestations of copper poisoning were evident at all studied concentrations of the metal. In M. menidia dilation of blood vessels was apparent, and in five cases hemorrhage had occurred in the brain and in periorbital connective tissues. Renal lesions in F. heteroclitus exposed to 1.0 and 5.0 mg/liter of copper were apparent; these changes could not be identified in M. menidia. Hepatic changes were not detectable by light microscopy in either species following external exposures to copper. High concentrations of copper administrated intraperitoneally to F. heteroclitus did induce liver damage. Fry of F. heteroclitus were more sensitive to copper than were the adults or their zygotes. The emergence of larval forms from the zygote, the time required for emergence, and their survival were impaired by the metal. Lesions were not evident in developing sensory areas of the lateral line or the olfactory systems in these immature forms. (Holoman-Battelle)
W73-11616

RESPONSE OF LOBSTERS HOMARUS AMERICANUS TO ODOR SOLUTION IN THE PRESENCE OF BLEACHED KRAFT MILL EFFLUENT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. W. McLeese.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 279-282, February 1973. 2 tab, 8 ref.

Descriptors: *Bioassay, *Odor, *Feeding rates, Industrial wastes, *Lobsters, Invertebrates, Water pollution effects, Crustaceans, Pulp and paper industry, Pulp wastes.
Identifiers: *Homarus americanus, *Bleached kraft mill effluent, Kraft mills, Bleach wastes, Macroinvertebrates.

Lobsters (Homarus Americanus) were exposed to dilute solutions of freeze-dried cod muscle extract (FDC) with and without bleached Kraft mill effluent (BKME) in flowing water runways to investigate the possible effect of BKME on feeding response. Differences between test and control responses occurred in only two of 12 comparisons when FDC was associated with 10, 50, and 100 percent BKME. With six concentrations of BKME, ranging from 0.01 to 2.0 percent, maintained in the runways, responses to FDC were variable, but average responses for controls and tests did not differ. Conditions in the latter tests

most closely approximated those in nature where some lobsters could be exposed continuously to low concentrations of BKME. It is concluded that exposure to low concentrations of BKME for short periods does not reduce the response of lobsters to FDC solutions or, if so, to a minor extent only. The effect of long-term exposures was not tested. (Little-Battelle)
W73-11619

EFFECTS OF A 12-HR AND 25-DAY EXPOSURE TO KRAFT PULP MILL EFFLUENT ON THE BLOOD AND TISSUES OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH),
British Columbia Research Council, Vancouver. Div. of Applied Biology.
D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 395-400, March 1973. 2 tab, 28 ref.

Descriptors: *Pulp wastes, *Salmon, *Juvenile fish, *Bioassay, *Water pollution effects, Fish physiology, Industrial wastes, Toxicity, Fish diseases, Lethal limit, Laboratory tests.
Identifiers: *Histopathology, *Blood, *Animal tissues, *Hematology, Oncorhynchus kisutch, Spleen, Kidney, Gills, Thyroid gland, Liver, Glycogen, Glucose, Plasma, Unbleached white water, Median tolerance limit.

Juvenile coho salmon (Oncorhynchus kisutch) were exposed for periods of 12 hr and 25 days to pulp mill waste (neutralized unbleached white water) collected from the main sewer of a coastal British Columbia kraft pulp mill in order to establish the 96-hr median tolerance limit. Red blood cell counts and hematocrits of juvenile coho salmon were unaltered by 12-hr exposure to neutralized kraft pulp mill effluent, although hematocrits were decreased by exposure for 25 days. The number of circulating immature erythrocytes increased in effluent-exposed fish in both the 12-hr and 25-day exposures. The number of circulating small lymphocytes decreased markedly after 12-hr exposure. However, following the prolonged exposure, the number of small lymphocytes returned to normal, while the number of circulating neutrophils increased. The level of plasma glucose increased in fish exposed to effluent for 12 hr, and decreased in fish exposed for 25 days. Liver glycogen was not altered significantly during either exposure period. No pathological changes attributable to exposure to kraft pulp mill were observed in the tissues examined, including the spleen, kidney, gill, interrenal gland, skin epithelium, and thyroid gland. Results are discussed in terms of a stress response. (Holoman-Battelle)
W73-11620

SURVIVAL AND GILL CONDITION OF BLUEGILL (LEPOMIS MACROCHIRUS) AND FATHEAD MINNOWS (PIMEPHALES PROMELAS) EXPOSED TO SODIUM NITRILOTRIACETATE (NTA) FOR 28 DAYS,
Bionomics, Inc., Wareham, Mass.
K. J. Macek, and R. N. Sturm.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 323-325, February 1973. 1 tab, 4 ref.

Descriptors: *Bioassay, *Toxicity, *Water pollution effects, Animal pathology, Freshwater fish, Fish diseases, Nitrilotriacetic acid, Rainbow trout, Lethal limit, Sunfishes, Minnows, Water analysis, Chemical analysis, Hardness (Water), Laboratory tests.
Identifiers: *Gills, *Lepomis macrochirus, *Pimephales promelas, *Continuous flow technique, *Sodium nitrilotriacetate, *Pollutant effects, Fathead minnow, Bluegills, Survival, Histology, Light microscopy, Continuous flow system, Median tolerance limit, Animal tissues.

The toxicity of NTA to bluegills and fathead minnows has been evaluated under conditions of 28 days' continuous exposure to measured concentrations of NTA ranging from a mean (SE) of 3.4 (0.2) to 172.8 (3.7) mg/liter. Tests were conducted in a continuous-flow proportional dilution apparatus, the flow rate of which was 6 liters/hr. During the 28-day study water samples were analyzed for NTA using the Zinc-Zincon method for sequestrant in waste and sewage (Thompson and Duthie, 1968). Gills from the exposed fish were fixed in Bouin's fixative, stained using Heidenhain's Azan technique, and examined microscopically for possible NTA-induced damage. Dynamic bioassays in soft water (35 mg/liter as CaCO3) indicated the 96-hr median tolerance limit (95 percent confidence interval) for NTA was 98 (72-133) mg/liter for rainbow trout, and 127 (93 170) mg/liter for fathead minnow. Such tolerance exceeded 1000 times the mean environmental levels that might be anticipated from detergent use. A 28-day dynamic bioassay with bluegill and fathead minnows indicated a lack of cumulative toxicity associated with levels of NTA up to 1000 times expected environmental concentrations in water. Fishes exposed to 96 mg/liter NTA for 28 days exhibited no NTA-induced gill pathology. (Holoman-Battelle)
W73-11621

THE OCCURRENCE AND SEASONAL VARIATION OF TRACE METALS IN THE SCALLOPS PECTEN MAXIMUS (L.) AND CHLAMYS OPERCULARIS (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Lab.
For primary bibliographic entry see Field 05A.
W73-11624

EXPERIMENTS ON THE MOVEMENT BEHAVIOR OF SINGLE-CELL FLOWING WATER ALGAE, (EXPERIMENTE ZUM BEWEGUNGSVERHALTEN VON EINZELLIGEN FLIESSWASSERALGEN),
Ekologiska Stationen, Messaure (Sweden).
A. Mueller-Haeckel.
Hydrobiologia, Vol 41, No 2, p 221-239, March 29, 1973. 13 fig, 1 tab, 7 ref.

Descriptors: *Diatoms, *Aquatic drift, Model studies, Flow rates, Streams, Laboratory equipment, Diurnal, Diel migration, Population.
Identifiers: *Colonization, *Repopulation, Ceratoneis arcus, Synedra minuscula, Achnanthes minutissima, Monoraphidium dybowskii.

A schematical model is given of the drifting and recolonization of algal cells in an artificial channel with algal growth on the bottom when water free of algae was flowing through, as well as of the colonization of a clean channel by algal cells, when water of a brook was flowing through. Both phenomena are compared with drift and colonization in a natural channel by means of quantitative sampling. Before settling down again after drifting away, a single algal cell may cover a distance of less than 38 m. Multiple sampling over a period of 24 hours demonstrated diurnal periodicity in the drifting and colonization of various algal species from running water. (Little-Battelle)
W73-11626

DURSBAN (TRADEMARK) AND DIAZINON RESIDUES IN BIOTA FOLLOWING TREATMENT OF INTERTIDAL PLOTS ON CAPE COD - 1967-69,
Bridgewater State Coll., Mass. Dept. of Chemistry.
V. M. Marganian, and W. J. Wall, Jr.
Pesticides Monitoring Journal, Vol 6, No 3, p 160-165, December 1972. 4 tab, 9 ref.

Descriptors: *Pesticide toxicity, *Diazinon, *Pesticide residues, *Gas chromatography, *Fish, *Clams, *Crabs, *Snails, *Oysters, Persistence, Sand, Mud, Separation techniques, Phosphothioate pesticides, Chlorinated hydrocarbon pesticides, Water analysis, Massachusetts, Storage, Sampling, Salt marshes, Diptera, Tubificids.
Identifiers: *Dursban, *Biological samples, *Sample preparation, *Polychaetes, Hermit crab, Culicoides spp, Tabanus spp, Cleanup, Detection limits, Precision, Chemical recovery, Fundulus, Mya arenaria, Modiolus demissus, Ribbed mussel, Mud snail, Nassarius obsoletus, Marsh snail, Melampus bidentatus, Gnats, Horseflies, Leptochelia, Palaemonetes, Uca, Sandworms, Quahog, Mercenaria mercenaria, Crassostrea virginica, Littorina littorea, Periwinkles, Fiddler crab, Carcinus maenas, Green crab, Pagurus longicarpus, Crangon, Arthropods.

Results are reported of a 3-year study (1967-69) conducted on Cape Cod, Massachusetts, to determine if the use of Dursban (Trademark) and diazinon for control of larvae of Culicoides melleus breeding in intertidal sand, C. hollensis and C. furens breeding in salt marsh mud, and Tabanus nigrovittatus and T. lineola breeding in salt marsh sod, would result in harmful effects to nontarget organisms and to determine residue levels in the intertidal biota. Nontarget organisms sampled included oligochaetes, polychaetes, clams, oysters, mussels, snails, crabs, prawns, periwinkles, and killifishes. Analytical methods were developed which consisted of blending samples of biota, sand, mud, or water with acetonitrile and petroleum ether. Samples were extracted three times with both extractants, treated with saturated NaCl solution and distilled water. The two aqueous layers were then treated with petroleum ether, and the ether phases combined and dried. The ether extracts were concentrated with nitrogen and subjected to gas chromatographic analysis. The detection limit was 0.01 ppm; the precision was 6 percent; and recovery ranged from 80-85 percent. The results showed that 1 percent granular Dursban (Trademark) applied manually at an optimum concentration of 0.05 lb/acre controlled Culicoides larvae effectively with no noticeable harm to fiddler crabs or other organisms. Residues recovered ranged from trace amounts to 2.30 ppm in white oligochaete, 2.58 ppm in ribbed mussel, 4.62 ppm in fiddler crab, 14.0 ppm in horsefly, and 15.7 ppm in marsh snail. Two percent granular diazinon applied manually at 0.20 lb/acre controlled Culicoides effectively, but killed small sand organisms. In general, concentrations of diazinon residues recovered were higher than those for Dursban (Trademark) in the same organisms reported above. Data collected on residues in organisms at various periods after treatment and persistence periods for these pesticides in substrates of intertidal sand, salt marsh sod, salt marsh mud, and seawater are also discussed. (Little-Battelle)
W73-11627

ORGANOCHLORINE INSECTICIDES IN SURFACE WATERS IN GERMANY-1970 AND 1971,
Bundesgesundheitsamt, Berlin (West Germany).
F. Herzel.
Pesticides Monitoring Journal, Vol 6, No 3, p 179-187, December 1972. 1 fig, 2 tab, 36 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Suspended solids, *Surface waters, *Chemical analysis, *Water analysis, *Pollutant identification, Insecticides, Phosphothioate pesticides, Water sampling, Methodology, DDT, DDD, DDE, Heptachlor, Dieldrin, Solvent extractions, Organophosphorus pesticides, Separation techniques, Gas chromatography.
Identifiers: *Germany, Sample preparation, Chemical recovery, Lindane, Alpha-BHC, Alpha Endosulfan, Beta-endosulfan, Parathion, Main River (Germany), Regnitz River (Germany), Rhine River, Electron capture gas chromatography, Microcoulometric gas chromatography, Detection limits, Flame ionization gas chromatography, Thin

layer chromatography, Cleanup, Hexachlorobenzene, Metabolites, Heptachlor epoxide, Elbe River, Weser River, Danube River, Ems River (Germany), Ruhr River (Germany), Sieg River (Germany), Lahn River (Germany), Moselle River (Germany), Lake Constance (Germany), Saale River (Germany), Havel River (Germany), Neckar River (Germany), Mittelland-Kanal (Germany), Nord-Oste-Kanal (Germany), Teltow Kanal (Germany).

As part of a series of studies initiated in 1969 to determine the organochlorine insecticide content of major waters in the Federal Republic of Germany, unfiltered water and suspended solids were analyzed from approximately 25 sites sampled in May 1971, and unfiltered water was analyzed from 7 sites sampled monthly from April 1970-June 1971. As in former studies (June and October 1969, April and September 1970), the insecticide concentrations found in waters and suspended solids were almost exclusively in the ppt range (ng/liter). The compounds found most frequently were gamma-BHC (lindane) and alpha-BHC; alpha and beta-endosulfan were detected in the Main, Regnitz, and Rhine Rivers. DDT and particularly its metabolites DDD and DDE were found infrequently except in samples from the Berlin Teltowkanal. Findings of heptachlor, heptachlor epoxide, dieldrin, and parathion (the only organophosphorous insecticide included in the study) were rare. (Holoman-Battelle)
W73-11628

SPRING PHYTOPLANKTON ABUNDANCE AND PRODUCTIVITY IN GRAND TRAVERSE BAY, LAKE MICHIGAN, 1970,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05B.
W73-11629

THE BACTERIOLOGY OF THE WATER SUPPLIES OF RANGOON: II. COOL DRY AND HOT DRY SEASONS,
Institute of Medicine (I), Rangoon (Burma). Dept. of Microbiology.
K. Sann-Myint, M. Tu, and H. Chen.
Union Burma J Life Sci. Vol 3, No 2, p 181-190, 1970. Illus.
Identifiers: Alcaligenes-Faecalis, Bacteriology, *Burma (Rangoon), Citrobacter-Freundii, *Coliform count, Clostridium-Perfringens, *Enterobacter, *E. Coli, Hot, Klebsiella-Aerogenes, Proteus-Mirabilis, Proteus-Vulgaris, Pseudomonas-Aeruginosa, Pseudomonas-Fluorescens, Seasons, Staphylococcus-Epidermidis, Streptococcus-Fecalis, *Water supply.

Water samples from 19 piped and natural sources in Rangoon were examined bacteriologically during the cool dry season of 1966-67 and the hot dry season of 1967 for the Presumptive Coliform Count, the Presumptive Enterococcus Count and the presence of Presumptive Clostridium perfringens. Bacteria isolated from MacConkey bile salt lactose peptone water and sodium azide medium primary cultures were identified. Using as criteria the Presumptive Coliform Count and the isolation of Escherichia coli and/or Klebsiella aerogens and/or Streptococcus faecalis, for the cool dry season, all of the 15 samples tested were found unsatisfactory for drinking purposes. Again, for the cool dry season, all of the 16 samples tested were found unsatisfactory. The bacteria isolated were E. coli, K. aerogenes, Citrobacter freundii, Enterobacter spp., Alcaligenes faecalis, Proteus mirabilis, P. morganii, P. vulgaris, Pseudomonas aeruginosa, P. fluorescens, Staphylococcus epidermis and S. faecalis. At room temperature, in the coliforms, E. coli and K. aerogenes were viable up to 140, and C. freundii (1 strain) up to 14 days. At 4 C, K. aerogenes, C. freundii (1 strain) and/or Enterobacter sp. (1 strain) were viable for 56, 14, and 7 days, respectively, and in the non-coliforms, P. mirabilis and P. morganii for 14, P. vulgaris (1 strain) for 28, and P. fluorescens for 56 days.--Copyright 1972, Biological Abstracts, Inc.
W73-11630

STUDIES ON SCHISTOSOMIASIS IN MEKONG BASIN: II. MALACOLOGICAL INVESTIGATIONS ON HUMAN SCHISTOSOMA FROM LAOS,
National Taiwan Univ., Taipei. Dept. of Parasitology.
C. T. Lo, E. G. Berry, and T. Iijima.
Chin J Microbiol. Vol 4, No 3/4, p 168-181, 1971. Illus.
Identifiers: *Laos (Mekong basin), *Malacological studies, *Mekong river basin, Oncomelania-Hupensis-Chiui, Oncomelania-Hupensis-Formosana, Oncomelania-Hupensis-Hupensis, Oncomelania-Hupensis-Nosophora, Oncomelania-Hupensis-Quadrasi, Pachydrobia-Bavayi, Pomatiopsis-Lapioria, Schistosoma, *Schistosomiasis, Tricula-Shini.

A snail survey was made in the area of Khong Island, Laos, from Dec. 1968 to Jan. 1969 to determine the molluscan host of human Schistosoma. A total of 13,269 snails from 10 spp. of operculates were examined for larval trematodes, and 26 types of larvae, including 6 furcocercous cercariae, were found. Three of the furcocercous cercariae were given to laboratory mice but the infection was negative, indicating that none of them were human schistosomes. Oncomelania hupensis hupensis, O. h. nosophora, O. h. quadrasi, O. h. formosana, O. h. chiui, Pomatiopsis lapidaria, Pachydrobia bavayi and Tricula shini were experimentally exposed to miracidia of Schistosoma originating from Laos, but cercariae were not obtained. P. bavayi in the family Hydrobiidae occurred in abundance in the Mekong River, and was suspected to be a likely snail host for the human Schistosoma in the area. Miracidia of the Laotian Schistosoma and the Japanese strain of S. japonicum penetrated successfully into this snail, but the life cycle of the parasite was not yet experimentally completed. More snails probably become infected during the early rainy season (April-June) and more snails probably shed cercariae from June-Aug. The Mekong River seems to be the major site of infection for both humans and snails.--Copyright 1972, Biological Abstracts, Inc.
W73-11633

POLLUTION EFFECTS ON PHYCOVIRUS AND HOST ALGAE ECOLOGY,
Delaware Univ., Newark. Dept. of Biological Sciences.
M. S. Shane, R. E. Cannon, and E. DeMichele.
Journal Water Pollution Control Federation, Vol 44, No 12, p 2294-2302, December 1972. 4 fig, 4 tab, 9 ref. OWRR-A-016-DEL (3).

Descriptors: *Bioindicators, *Cyanophyta, *Water pollution, *Water pollution sources, *Ecological distributions, *Hosts, *Water pollution effects, Chemical analysis, Plant viruses, Aquatic algae, *Delaware, Water sampling, Water analysis, Aquatic plants, Water chemistry, Water temperature, Alkalinity, Turbidity, Coliforms, Biochemical oxygen demand, Chemical oxygen demand, Oxygen demand, Dissolved oxygen, Zinc, Phosphates, Nitrates, Nitrites, Ammonia, Heavy metals, Hardness (Water), Iron, Chromium.
Identifiers: *Phycoviruses, Lyngbya, Plectonema boryanum, *Christina River (Del), Phormidium, Most probable number test, LPP viruses.

Chemical, physical, and biological parameters of pollution were measured at 11 stations along the Christina River (Delaware) which were located from source to mouth. The purpose was to determine the distribution of Lyngbya, Phormidium, and Plectonema viruses in relationship to pollution. Biochemical oxygen demand, chemical oxygen demand, dissolved oxygen, phosphate, nitrate-, nitrite-, NH3-nitrogen, heavy metals, hardness, pH, temperature, alkalinity, turbidity, and coliform data are reported. These data give strong indications that Lyngbya, Phormidium, and Plectonema viruses are associated with cultural pollution. (Holoman-Battelle)
W73-11635

IDENTIFICATION OF THE CONSTITUENTS OF KRAFT PULPING EFFLUENT THAT ARE TOXIC TO JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH),
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 05A.
W73-11638

PLANKTONIC CHANGES FOLLOWING THE RESTORATION OF LAKE TRUMEN, SWEDEN,
Lund Univ. (Sweden). Limnology Inst.
For primary bibliographic entry see Field 05G.
W73-11639

THE ROLE OF NITROGEN IN THE AQUATIC ENVIRONMENT,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
D. M. Martin, and D. R. Goff.
Available from the National Technical Information Service as PB-213 496, $3.00 in paper copy, $0.95 in microfiche. Report No. ANSP-CLDP-2, 1972. 46 p, 2 fig, 2 tab, 78 ref.

Descriptors: *Nitrogen, *Nutrients, *Aquatic environment, *Eutrophication, *Cycling nutrients, *Nitrogen cycle, Nitrogen fixation, Water pollution sources, Nitrogen compounds, Toxicity, Absorption, Water quality standards, Path of pollutants, Trophic level, Groundwater, Lakes, Oceans, Industrial wastes, Municipal wastes, Denitrification, Nitrification, Chemical reactions, Urban runoff, Farm wastes, Ion exchange, Biological treatment, Reverse osmosis, Methodology, Aquatic plants, Cations, Nitrates, Nitrites, Septic tanks, Drainage, Precipitation (Atmospheric), Geologic formations, Weathering, Decomposing organic matter, Scale, Water quality control, Ammonia, Chlorination, Anions.
Identifiers: *Biotransformation, Pollutant removal, Ammonia stripping, Denitrification rates.

A comprehensive, up-to-date overview is presented of the significance and interactions of various nitrogen compounds within the aquatic environment. Sections are included on nitrogen occurrence (flowing water, ground water, lakes, oceans); mechanics of transformation, uptake and release; sources, toxicity, methods of treatment for removal; and association with eutrophication and water quality standards. The term 'Eutrophication' has been very loosely used in the past. One of the common results of increased nitrogen loading, especially in water-bodies known to previously have had limited biological productivity due to nitrogen deficiences is, 'Eutrophication.' However, the authors caution against predictive generalization about the response of plants to any single nutrient applicable to all situations. Many factors such as turbidity, predator pressure, thermal effects and availability of complementary nutrients may be overriding in any given situation. To single out for removal any one nutrient, or to recommend a specific treatment method applicable to all situations is not realistic. (Holoman-Battelle)
W73-11640

SMITHSONIAN ADVISORY COMMITTEE REPORT ON STUDIES OF THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT,
Smithsonian Institution, Washington, D.C. Oceanography and Limnology Program.

M. A. Buzas, J. H. Carpenter, B. H. Ketchum, J. H. McHugh, and V. J. Norton.
Available from the National Technical Information Service as AD-746 960, Report, July 1972. 60 p, 3 append. Contract No. DAWC 72-70-C-0016.

Descriptors: *Water pollution effects, *Water pollution control, *Water quality, *Sludge disposal, *Reviews, Heavy metals, Coliforms, Benthos, Zooplankton, Amphipoda, Fish, Sampling, Copepods, Turbidity, Suspended solids, Waste disposal, Water temperature, Salinity, Sediments, Phosphorous, Phosphates, Nitrates, Iron, Dissolved oxygen, Zinc, Molybdenum, Manganese, Copper, Aluminum, Lead, Chromium, Mercury, Biomass, Statistical methods, Sewage sludge, Clams, Lobsters.
Identifiers: *New York Bight, Data interpretation, Orthophosphates, Chlorophyll a, Boron, Barium, Strontium, Foraminifera, Dredge spoils, Species diversity, Macroinvertebrates, Quahog.

Reports of studies by the U.S. Army Coastal Engineering Research Center on the effects of waste disposal in the New York Bight were reviewed. The reviews point out shortcomings in the data which prevent drawing definite conclusions about the effects of waste disposal and suggest areas for further research which will overcome this deficiency. Recommendations are included regarding further research on this area and on dumping practices. The major recommendation on disposal is that acceptable alternatives should be sought but in the meantime more effective management and control must be instituted. (Little-Battelle)
W73-11642

CYCLING OF ELEMENTS OF ESTUARIES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 05B.
W73-11645

INFLUENCE OF LEAD AND OTHER METALS ON FISH DELTA-AMINOLEVULINATE DEHYDRASE ACTIVITY,
National Marine Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 05A.
W73-11646

RECOVERY OF SALT MARSH VEGETATION FROM SUCCESSIVE OIL SPILLAGES,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. M. Baker.
Environmental Pollution, Vol 4, No 3, p 223-230, April 1973. 5 fig, 1 tab, 2 ref.

Descriptors: *Oil spills, *Dominant organisms, *Salt marshes, *Aquatic plants, Oil pollution, Water pollution effects, Toxicity, Estuarine environment, Grasses, Marsh plants.
Identifiers: *Recovery, Spartina anglica, Puccinellia maritima, Juncus maritimus, Bogrush, Rushes, Alkali grass, Cordgrass.

Field experiments involving different numbers of successive oilings with Kuwait crude were carried out on three types of salt marsh vegetation (Spartina anglica, Puccinellia maritima, Juncus maritimus) in 1968. Recovery from up to four oilings was generally good, but considerable changes resulted from eight and twelve oilings. changes in species dominance or exposure of bare mud persisted in 1972, inidcating that recovery was likely to be very slow. (Little-Battelle)
W73-11649

SMALL-SCALE EXPERIMENTS TO DETERMINE THE EFFECTS OF CRUDE OIL FILMS ON GAS EXCHANGE OVER THE CORAL BACK-REEF AT HERON ISLAND,
D. W. Kinsey.
Environmental Pollution, Vol 4, No 3, p 167-182, April 1973. 5 fig, 1 tab, 12 ref, 2 append.

Descriptors: *Oil spills, *Reefs, *Toxicity, Dissolved oxygen, Carbon dioxide, Water pollution effects, Oil pollution, Water temperature, Hydrogen ion concentration, Alkalinity, Salinity, Wind velocity, On-site investigations, Sea water, Marine animals, Pacific Ocean, Respiration.
Identifiers: *Gas exchange, Moonie crude oil, Crude oil, Heron Island, Australia.

A coral reef at Heron Island which is subjected to low-tide slack water conditions, was fenced with steel posts, fencing wire, and acetate-covered wire mesh for investigation of the effect of oil slicks on gas exchange. Three tests were conducted during low tides: (1) Control with no oil film; (2) with an oil film of about 0.1 mm thickness; and (3) with an oil film of about 0.7 mm thickness. Moonie crude oil was used in the experiments. Oxygen levels, temperature, pH, alkalinity, salinity, and wind speed were measured. Carbon dioxide was calculated from other data. The following points were indicated: (1) Films as thin as 0.1 mm caused considerable calming of the water surface; (2) Under conditions of light wind, films of 0.1 mm and 0.7 mm nominal thickness caused no significant interference with oxygen and carbon dioxide transfer through the water surface other than that associated directly with the calming effect. Respiration of the reef community remained normal (3) A 0.1 mm film of the heavier residual oil left after prolonged exposure of the fresh crude may have given some slight interference with gas transfer but it is more probable that this effect was an artefact to temperature; (4) No toxicity effects or abnormal behavior patterns were observed over the time periods used (5) More information is required on the effects of dead calm weather, higher temperature, thicker and more viscous oil films, and longer periods of exposure. (Little-Battelle)
W73-11650

LOW PH VALUES SHOWN TO AFFECT DEVELOPING FISH EGGS (BRACHYDANIO RERIO HAM.-BUCH.),
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
N. Johansson, J. E. Kihlstrom, and A. Wahlberg.
AMBIO, Vol 2, Nos 1/2, p 42-43, February 1973. 4 fig, 11 ref.

Descriptors: *Water pollution effects, *Hydrogen ion concentration, *Bioassay, *Fish eggs, *Hatching, *Sulfur compounds, Air pollution, Path of pollutants, Water pollution sources, Fish reproduction, Toxicity, Freshwater fish.
Identifiers: *Survival, Zebrafish, Brachydanio rerio.

Since the acidity of lakes and rivers in northwestern Europe has been increasing, purportedly due to emission of sulfur compounds into the atmosphere from burning fossil fuel, tests were conducted with zebrafish eggs to determine the effects on fish populations. Eggs were collected and reared at 25 C in petri dishes containing water at pH ranges of 4.0 to 10.0. Dead and hatched eggs were counted daily. About 2100 eggs were studied. The frequency of hatching decreased from about 50 percent at pH 7 to about four percent at pH 4, the young embryos being the most sensitive to the acid water. There was also a tendency towards a prolongation of the period from fertilization to hatching at low pH values. In slightly alkaline solutions the frequency of hatching remained unchanged, but there was a slight shortening of the period from fertilization to hatching. (Little-Battelle)
W73-11651

SUBLETHAL EFFECTS OF BALTIMORE HARBOR WATER ON THE WHITE PERCH, MORONE AMERICANA, AND THE HOGCHOKER, TRINECTES MACULATUS,
Maryland Univ., Solomons. Natural Resources Inst.
R. P. Morgan, II, R. F. Fleming, V. J. Rasin, Jr., and D. R. Heinle.
Chesapeake Science, Vol 14, No 1, p 17-27, March 1973. 1 fig, 5 tab, 27 ref.

Descriptors: *Fish physiology, *Bioassay, *White perch, *Heavy metals, *Dieldrin, *Enzymes, Cadmium, Chromium, Copper, Iron, Mercury, Zinc, Water pollution effects, Marine fish, Sea basses, Laboratory equipment, Industrial wastes, Domestic wastes, Toxicity.
Identifiers: *Baltimore Harbor, *Hogchokers, *Histology, Morone americana, Trinectes maculatus, Roccus americanus, Patuxent River, Biological samples, Sample preparation, Blood, Tissue, Brain, Liver, Gills, Kidney, Muscle, Fat, Thrombocyte, Neutrophil, Basophil, Lactate dehydrogenase, Acetylcholinesterase, Lymphocyte.

Possible sublethal effects of Baltimore Harbor Water, which receives various industrial and domestic wastes, were investigated in bioassays with white perch and hogchokers. The tests were conducted in 170-liter polyethylene tanks containing full-strength Harbor water, half-strength Harbor water and water from the Patuxent River. Exposures were for 14 to 30 days for white perch and 7 to 28 days for hogchokers. After exposure, blood samples were collected for differential staining and bodies were dissected for enzyme, histology, heavy metal, and pesticide analyses. There were no significant variations in Cd, Cr, Cu, Fe, Hg, and Zn in the three tests. Dieldrin was the only pesticide found and variations were slight among the tests. However, physiological effects of Baltimore Harbor water included changes in thrombocyte, neutrophil, and basophil levels in white perch. Biochemical effects included increased LDH activity in the serum of white perch and hogchokers when exposed to Baltimore Harbor water, decreased acetylcholinesterase activity in white perch and hogchoker brains, and decreased catalase levels of the liver of both white perch and hogchokers. Sublethal effects were noted at the longer (28 and 30 day) exposures to the Baltimore Harbor water. (Little-Battelle)
W73-11652

TEMPERATURE EFFECTS ON MERCURY ACCUMULATION, TOXICITY, AND METABOLIC RATE IN RAINBOW TROUT (SALMO GAIRDNERI),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. C. MacLeod, and E. Pessah.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 485-492, April 1973. 5 fig, 4 tab, 24 ref.

Descriptors: *Mercury, *Toxicity, *Rainbow trout, *Bioassay, Juvenile fish, Fish physiology, Heavy metals, Water temperature, Fry, Animal metabolism, Chemical analysis, Mortality, Water pollution effects, Laboratory tests.
Identifiers: *Bioaccumulation, *Metabolic rates, *Biological magnification, Median tolerance limit, Mercuric chloride, Phenylmercuric acetate, Animal tissues, Muscle, Organomercury compounds, Wet digestion, Flameless atomic absorption spectrophotometry, Bone, Skin.

Hatchery-reared rainbow trout fingerlings were exposed to 5 concentrations of mercury (mercuric chloride and phenylmercuric acetate) at each of three temperatures (5, 10, and 20 C) in aquaria. Each aquarium was divided into 2 compartments, one holding 10-15 fish for assessing mortality and the other, 6 fish for Hg residue determinations in their flesh. Two fish were removed after 6, 24, and 96 hr of exposure, frozen whole and later thawed and weighed. The muscle, bones and skin were

analyzed for total Hg by a wet digestion and flameless atomic absorption spectrophotometric method. Active metabolism determinations were made in respirometer flasks equipped with magnetic stirrers. Mercury toxicity was related to temperature and chemical formulation of the mercury. At 10C, the 24-hr TL sub m concentration (median tolerance limit) for mercuric chloride (HgCl2) was approximately 30 times that for phenyl mercuric acetate (PMA). The 96-hr TL sub m values for mercuric chloride at 5, 10, and 20C were 0.40, 0.28, and 0.22 mg Hg/liter. The velocity of mortality, (V equals reciprocal of time to death in hours), was linearly related to temperature. For a mercuric chloride concentration of 0.5 mg Hg/liter, V equals 0.002 plus 0.0023t, where t equals temperature in centigrade degrees. Temperature also affected accumulation rate of mercury in the fish muscle. At 5, 10, and 20C a mercuric chloride concentration of 0.1 mg Hg/liter in the water produced biological magnification factors (conc. in fish divided by conc. in water) of 4, 10, and 22 times, respectively. PMA produced higher magnification factors of 80-100 times at 10C. Active metabolic rate, though increased by higher temperatures, was depressed by mercuric chloride, and higher temperatures augmented the depressant effect. (Holoman-Battelle)
W73-11655

EFFECTS OF SUBLETHAL CONCENTRATIONS OF SODIUM PENTACHLOROPHENATE ON GROWTH RATE, FOOD CONVERSION EFFICIENCY, AND SWIMMING PERFORMANCE IN UNDERYEARLING SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
P. W. Webb, and J. R. Brett.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 499-507, April 1973. 7 fig, 1 tab, 19 ref.

Descriptors: *Sockeye salmon, *Phenolic pesticides, *Growth rates, *Bioassay, *Pesticide toxicity, Juvenile fish, Fish physiology, Fish behavior, Water pollution effects, Bactericides, Herbicides, Laboratory tests, Insecticides, Smolt, Lethal limit, Chlorinated hydrocarbon pesticides, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Animal metabolism, Stress.
Identifiers: *Food conversion efficiency, *Sodium pentachlorophenate, Data interpretation, Oncorhynchus nerka, Median tolerance limit, Pentachlorophenol.

Two response systems, swimming speed and growth (along with food conversion efficiency) have been used as indicators of stress from sublethal concentrations of sodium pentachlorophenate. Tests were performed at 15C, pH 6.8, and dissolved oxygen values of 90-100 percent air saturation. Growth rate and conversion efficiency were measured by feeding a ration level of 15 percent body dry weight/day to underyearling sockeye salmon (Oncorhynchus nerka) held at sodium pentachlorophenate (PCP) concentrations of 0, 1.14, 1.99, 3.49, 7.16, 13.60, 27.73, 31.57, and 47.18 ppb. Swimming performance was measured at PCP concentrations of 0, 7.21, 19.00 and 50.00 ppb. The 96-hr LC50 was 63 ppb PCP. Growth rate and conversion efficiency were almost equally affected by PCP, the EC50 values being 1.74 for ppb for growth rate and 1.80 ppb for conversion efficiency. This is approximately 2.8 percent of the 96-hr LC50. Swimming performance was unaffected by PCP at the concentrations used. (Holoman-Battelle)
W73-11656

THE NEED FOR HYDROGEOLOGIC EVALUATIONS IN A MINE DRAINAGE ABATEMENT PROGRAM: A CASE STUDY, TOMS RUN, CLARION COUNTY, PENNSYLVANIA,
Pennsylvania Dept. of Health, Harrisburg. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W73-11674

INFLUENCE OF AGRICULTURAL PRACTICES ON WATER QUALITY IN NEBRASKA: A SURVEY OF STREAMS, GROUNDWATER, AND PRECIPITATION,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-11696

5D. Waste Treatment Processes

CANNERY WASTEWATER TREATMENT WITH ROTATING BIOLOGICAL CONTACTOR AND EXTENDED AERATION,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
M. W. Cochrane, R. J. Burm, and K. A. Dostal.
Copy available from GPO Sup Doc as EP1.23/2:73-024, $0.90; microfiche from NTIS as PB-221 333, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-024, April 1973. 62 p, 11 fig, 13 tab, 10 ref. EPA Project 12060.

Descriptors: *Waste water treatment, Water pollution control, *Industrial wastes, *Canneries, *Biological treatment, Aerobic treatment, *Aeration.
Identifiers: *Extended aeration, *Rotating biological contactor.

Fruit and vegetable cannery wastewater was treated during two canning seasons by two pilot plants of the rotating biological contactor (RBC) and extended aeration types. The objective was to determine the effectiveness of these biological treatments processes on cannery wastewater and to compare the two units under the same operating conditions. Nitrogen and phosphorus were added to the influent wastewater so the BOD:N:P ratio was kept above 100:5:1. Both treatment units attained organic removals of over 90%. However, much less detention time was necessary in the RBC to obtain removals comparable to the extended aeration plant. Sludge produced by the RBC required additional treatment, but most of the sludge produced in the extended aeration plant was aerobically digested in the aeration tank. Effluent quality from both units was about the same over the operating temperature range of 10-20C, although the RBC appeared to recover more rapidly from organic shock loading. Neither unit produced an effluent that could be discharged to surface waters without further treatment. (EPA)
W73-11058

MARINE SANITATION SYSTEM DEMONSTRATION,
Delaware River and Bay Authority, New Castle.
E. L. Kaminsky, W. F. Roberts, and J. C. Volk, Jr.
Copy available from GPO Sup Doc as EP1.23/2:73-226, $1.25; microfiche from NTIS as PB-221 334, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-226, May 1973. 105 p, 25 fig, 29 tab, 2 ref. EPA Project 15020 GYM.

Descriptors: *Activated carbon, *Chlorination, Treatment, *Recycling, *Waste water treatment, Tertiary treatment, *Environmental sanitation.
Identifiers: *Marine sanitation system.

A 'flow-through' physical-chemical marine sanitation system capable of providing a high degree of secondary treatment was successfully demonstrated in the laboratory and on board the Delaware River and Bay Authority's Cape May-Lewes Ferry. Effluent performance goals of suspended solids and BOD5 less than 50 mg/l and coliform bacteria count less than 240 MPN/100 ml were met. Following promulgation of the Environmental Protection Agency's 'No Discharge' standard, the system (without the addition of any treatment processes) was also tested in a recycle mode by recycling the treated effluent for toilet flushing purposes. On the first recycle day, the suspended solids and BOD5 remained at the 'flow-through' levels. With each succeeding day the suspended solids increased only slightly, but the BOD5 increased to values ranging between 140 and 400 mg/l. Coliform bacteria count was less than 10 MPN/100 ml. The color of the recycled water changed from clear to a gray milky appearance. A noticeable ammonia odor appeared on the second day. Ammonia nitrogen levels were in the 50-460 range. The ammonia can be removed by air stripping or breakpoint chlorination, and the increased BOD5 levels can be reduced by chemical oxidation. (EPA)
W73-11059

STEAM STRIPPING ODOROUS SUBSTANCES FROM KRAFT EFFLUENT STREAMS (SEKOR),
Washington Univ., Seattle.
B. F. Hrutfiord, L. N. Johanson, and J. L. McCarthy.
Copy available from GPO Sup Doc as EP1.23/2:73-196, $1.25; microfiche from NTIS as PB-221 335, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-196, April 1973. 81 p, 9 fig, 24 tab, 40 ref. EPA Project 12040 EXQ.

Descriptors: Steam, *Pulp wastes, Pollution abatement, Water reuse, Recovery, Odor, Sulfur compounds, Organic compounds, *Waste water treatment.
Identifiers: *Steam stripping, Pulp condensates, *Volatiles, Terpenes, Methyl mercaptan, Methanol, Trupentine, *Odor control, Black liquor.

Laboratory and design studies have been completed relating to volatile constituents which appear in Kraft black liquor and condensate streams, and how these can best be removed and recovered. In order of decreasing concentration the volatile constituents are alcohols, terpenes, ketones, sulfur bearing compounds, and phenolic compounds. Methanol, the major alcohol contaminant, is found in from 280 to 8400 ppm in condensate streams, amounting to 11 to 16 pounds per ton of pulp produced. Terpenes are found to range from a few ppm to about 4500 ppm in condensates, 4 to 9 pounds per ton of pulp. Acetone is present at concentrations of 2 to 200 ppm, corresponding to 0.07 to 0.4 pounds per ton of pulp. In all, some 40 compounds were present in condensate streams. The feasibility of combining steam stripping of Kraft liquor with steam stripping of condensates was explored, and the conditions under which this may be warranted are reported. Under most present mill situations, steam stripping of black liquor and the last stages of evaporator condensates does not appear to be warranted except in unusual cases. Exploratory type studies were made and are reported concerning improved methods of predicting vapor-liquid equilibria in such systems, and separation of the resulting volatile oils. (EPA)
W73-11060

AEROBIC SECONDARY TREATMENT OF PLYWOOD GLUE WASTES,
Columbia Plywood Corp., Portland, Oreg.
J. L. Graham.
Copy available from GPO Sup Doc as EP1.23/2:73-195, $2.90; microfiche from NTIS as PB-221 338, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-195, April 1973. EPA Project 12100 EZU.

Descriptors: *Waste water treatment, *Industrial wastes, *Aerobic treatment, *Activated sludge, Biological treatment, Wood wastes, Tertiary treatment, *Oregon, Biochemical oxygen demand.
Identifiers: *Plywood glue wastes, Tube settler, Klamath Falls (Ore).

An activated sludge treatment system, consisting of an aeration tank, a tube-settler clarification module and a waste solids lagoon, was constructed at Klamath Plywood Corporation in Klamath Falls, Oregon to treat urea-formaldehyde glue and steam vat condensate waste -water. Operation of the system was studied over a period of 18 months. Prior to operation of the system, several in-plant changes were made to reduce the flow and BOD loading. The flow to the treatment system was reduced from about 40,000 gallons per day to about 8,000 gallons per day and BOD from 500-1,000 pounds per day to 100-400 pounds per day. During the period of greatest efficiency, the flow averaged 6,700 gallons per day and the BOD averaged 182 pounds per day. The results indicate that activated sludge treatment of urea-formaldehyde glue waste alone is not feasible (average BOD removal of 8 precent). The combined wastewater is amenable to treatment by activated sludge, but requires the addition of phosphorus. Without nutrient addition, the average BOD removal was 38 percent. During the period when phosphorus was added to the system, the BOD removal averaged 78 percent. The flow averaged 9,800 gallons per day during the latter period. Treatment efficiency was adversely affected by cold weather during part of the study period. (EPA)
W73-11065

SOLVENT EXTRACTION STATUS REPORT,
Robert S. Kerr Water Research Center, Ada, Okla.
L. F. Mayhue.
Copy available from GPO Sup Doc as EP1.23/2:72-073, $0.75; from NTIS as PB-221 458, $2.75 in paper copy, $0.95 in microfiche. Environmental Protection Agency, Technology Series Report EPA-R2-72-073, December 1972. 38 p, 6 fig, 1 tab, 24 ref. EPA Project 12020 EWZ.

Descriptors: *Solvent extractions, *Separation techniques, Desalination processes, Solubility, Solvents, *Waste water treatment, Tertiary treatment, *Water reuse, Water allocation, Immiscibility, Industrial wastes, *Reviews.
Identifiers: Solvent solubility, Solvent selectivity, Liquid extraction contactors.

The history, basic principles, process application, laboratory approach, and grant program concerning solvent (liquid-liquid) extraction was investigated in relation to its application to industrial effluent waste water systems. A search of the literature reveals that little consideration has been given to solvent extraction as a feasible waste treatment method. Various aspects of solvent extraction technology are presented along with a number of industrial wastes which should be considered for treatment. One of the areas of greatest need for research concerning industrial waste water treatment is in the removal of refractory, and taste and odor causing compounds. Application of solvent extraction to waste systems containing low concentrations (0.05%) may be feasible on a 'swap out' basis or in conjunction with biological, adsorption, or incineration treatments as a pretreatment step. Application of solvent extraction to waste systems for recovery of salable products to offset cost of treatment should be studied for feasibility. Accomplishments and plans regarding industrial research projects are presented. (EPA)
W73-11066

OXIDATION OF PYRITES IN CHLORINATED SOLVENTS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
J. A. Boros, D. R. Brenneman, and J. C. Troy.
Copy availabNo. le from GPO Sup Doc as EP1.23/2:72-069, $1.00; microfiche from NTIS as PB-214 455, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-069, November 1972. 52 p, 11 fig, 11 tab, 20 ref. EPA Project 14010 FMM, Contract 14-12-897.

Descriptors: *Pyrites, *Chlorination, *Coal mine wastes, *Iron compounds, *Sulfur compounds, Waste dumps, Ultimate disposal, Acid mine water, Water pollution sources, Sulfides, Pollution abatement, Waste water treatment.
Identifiers: *Non-aqueous chlorination, Chlorinated solvents.

The purpose was to develop methods for extracting sulfur and iron compounds from pyritic waste materials, producing a final refuse that is incapable of causing water pollution, and at the same time, conserving useful mineral resources. The primary method under investigation was the chlorination of pyrites in non-aqueous solvents. An attractive feature of the proposed method was its cyclic nature. Chlorine would serve as the original driving force for the expected reactions, but would be replaced as primary oxidant by two products of the chlorination reaction, ferric chloride and sulfur dichloride. Test results indicated that the successful extraction of sulfur and iron compounds depended upon the continuous addition of chlorine gas to the system. The expected replacement of chlorine by ferric chloride and sulfur dichloride was not achieved under conditions of this study. The reaction rates with chlorine gas varied with the particle size and source of the pyritic material; with the choice of solvent; and with the means of providing intimate contact between pyrites and chlorine-saturated solvents. Recycling solvents through beds of pyrite significantly improved rates of reaction, while elevated temperatures and treatment in the presence of ultra-violet radiation yielded slight improvements in reaction rate. (EPA)
W73-11068

CHARACTERIZATION OF THE ACTIVATED SLUDGE PROCESS,
Los Angeles Bureau of Sanitation, Calif.
R. D. Bargman, and J. Borgerding.
Copy available from GPO Sup Doc as EP1.23/2:73-224, $0.95; microfiche from NTIS as PB-221 340, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-224, April 1973. 63 p, 29 fig, 6 tab, 6 ref. EPA Project 17090 FJU, Contract 14-12-148.

Descriptors: *Activated sludge, *Kinetics, Model studies, *Waste water treatment, Measurement, Operations, Control, Mathematical models, California, Aeration, Sewage treatment, Settling basins, Sewage, Sewage effluents, Treatment facilities.
Identifiers: Hyperion, Time dependent, *Phosphorus removal, BOD removal, Sludge production, Technicon.

Operational control parameters of the activated sludge process during steady-state and transient flow conditions were evaluated and related to carbon, nitrogen, and phosphorus removals. During steady-state testing, chemical oxygen demand, net growth rate, aeration tank detention time, and final settling tank detention time were found to be the key operational control parameters. Changes in COD removal and suspended solids removal were found to be proportional to a change in control parameter. Nitrogen removal was related to specific operational parameters and system nitrogen balances were computed. Phosphorus removal without external chemical addition was related to specific operational parameters. (Smith-EPA)
W73-11069

DEVELOPMENT AND PRELIMINARY DESIGN OF A SORBENT-OIL RECOVERY SYSTEM,
Hydronautics, Inc., Laurel, Md.
For primary bibliographic entry see Field 05G.
W73-11071

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM,
Northern Maine Regional Planning Commission, Presque Isle.
J. A. Barresi, J. Gammon, and R. E. Hunter.
Copy available from GPO Sup Doc as EP1.23/3:73-013, $3.45; microfiche from NTIS as PB-221 346, $0.95. Environmental Protection Agency, Socioeconomic Environmental Studies Series Report EPA-R5-73-013, April 1973. 333 p, 68 fig, 149 tab, 41 ref. EPA Project 16110 DPT. R and D, Feb 1971-Dec.

Descriptors: *Regional analysis, Municipal wastes, Potatoes, Sugar Beets, Inter-basin transfers, *Reviews, *Maine, Cost sharing, *Waste water treatment, Cost analysis, Industrial wastes, Treatment facilities, Sampling.
Identifiers: International stream (US-Canada), St. John River, Aroostook River, Prestile stream, Aroostook County, *Regional treatment, *Potato processing wastes, *Combined treatment.

Detailed sampling, gaging and laboratory analyses determined current waste loads from the Aroostook-Prestile Basin's potato processing industry. Studies indicated that significant reductions in load could be accomplished by in-plant conservation. Biological treatment of the residual wastes, however, was found necessary. Preliminary designs were prepared for numerous treatment and loading operations, including joint industry-municipal plants and regionally inter-connected systems. A transport-treatment channel system covering some eleven miles was shown to be technically feasible. Cost analyses of all viable options and alternatives were prepared, including capital and operating costs. Annual revenue requirements for each system were projected, including evaluation of current State and Federal grant-in-aid programs. Joint municipal-industrial treatment facilities proved the most economic course of action. The technical studies of the research and development program were evaluated for water quality impact on the receiving waters, as determined by Companion River Basin Studies. (EPA)
W73-11079

STATE-OF-THE-ART REVIEW OF PULP AND PAPER WASTE TREATMENT,
Wapora, Inc., Washington, D.C.
H. Gehm.
Copy available from GPO Sup Doc as EP1.23/2:73-184, $2.85; microfiche from NTIS as PB-221 434, $0.95. NTIS PC$5.35. Environmental Protection Agency, Technology Series Report, EPA-R2-73-184, April 1973. 252 p. EPA Projects 12040 GLV and 12040 HAR. 68-01-0012.

Descriptors: *Pulp wastes, *Pulp and paper industry, Sulfite liquors, Waste treatment, Sludge treatment, *Reviews, *Waste water treatment, Sludge disposal, Oxidation, Suspended solids, Wood wastes, Industrial wastes.
Identifiers: *Waste characteristics, Treatment costs.

The state of the art in the treatment of pulp and paper mill wastewater as it stands in 1971 is presented. A review of both the general economic position of the industry as a whole and the major production processes is included. Such a background is needed since a considerable degree of loss control is practiced within the processes and water recycling is an almost universal practice in this industry. Included also is a review of the water quality problems which the applied treatment processes are designed to rectify. Performance data for treatment processes and systems are presented together with a review of the applicability of common analytical methods to the measurement of waste characteristics and treatment effectiveness. The techniques used to monitor waste flowages for control purposes and as means of recording treatment efficiency are in-

cluded. Finally, the remaining problems relative to control and treatment of pulp and paper mill spent process waters are pointed out. Research and development needs directed toward solving these problems are defined in the light of programs currently underway. (EPA)
W73-11080

OCCURRENCE OF SALMONELLA IN OXIDATION DITCHES,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Zoonoses.
For primary bibliographic entry see Field 05A.
W73-11136

REMOVAL OF MERCURY FROM AQUEOUS SOLUTIONS BY NITROGEN-CONTAINING CHEMICALLY MODIFIED COTTON,
Southern Regional Research Lab., New Orleans, La.
E. J. Roberts, and S. P. Rowland.
Environmental Science and Technology, Vol 7, No 6, p 552-555, June 1973. 3 fig, 1 tab, 12 ref.

Descriptors: *Mercury, *Aqueous solutions, *Cotton, *Waste water treatment, Laboratory tests, Analytical techniques, Testing procedures, Separation techniques, Filtration, Chemical reactions, Chemical analysis, Fibers, Polymers, Pollutants.

Four chemically modified cotton celluloses were investigated for effectiveness in sorbing (Hg++) from aqueous solutions. Effectiveness of these compositions was due to amine units of the following types: ethylenimine network polymer formed in the fibers, polyethylenimine sorbed on the fibers, 2-diethylaminoethyl substituents in the cellulose. Cotton celluloses modified with 2-diethylaminoethyl or 2-aminoethyl substituents were the more effective compositions at concentrations of mercury above 1000 ppb. Cotton cellulose containing ethylenimine network polymer was most effective on the basis of the weight of the cellulosic composition. Sorbed mercury can be readily removed from the chemically modified cottons for recovery of the former and reuse of the latter. (Jerome-Vanderbilt)
W73-11174

MINERAL INDUSTRY VS. ECOLOGY.
For primary bibliographic entry see Field 05G.
W73-11185

PROCESS FOR THE REMOVAL OF CYANIDE FROM SEWAGE BY MEANS OF FORMALDEHYDE,
NIKEX, Budapest (Hungary). (assignee)
Z. Csuros, J. Petro, Z. Dusza, Z. Simo nee Barczy, and I. Turcsan.
U. S. Patent No. 3,729,413, 2 p, 3 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1354, April 24, 1973.

Descriptors: *Patents, Separation techniques, Poisons, *Pollutants, *Chemical reactions, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control.
Identifiers: *Cyanide, *Chemical treatment, Glycolic acid.

The process for the removal of cyanide from sewage comprises converting the cyanide to glycolic acid by adding to the sewage at least one mol of formaldehyde solution per mol of cyanide and at a pH of at least 8 with intensive agitation. The solution is then allowed to stand at room temperature to 100C for 1 to 50 hours. A metal salt is added to the solution to recover the glycolic acid as the metal glycolate. (Sinha-OEIS)
W73-11224

DE-OILING OF POLLUTED WATERS,
Agence Nationale de Valorisation de la Recherche, Courvevoie (France). (assignee)
A. Abadie, A. Gazost, and H. Roques.
U. S. Patent No. 3,729,410, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1354, April 24, 1973.

Descriptors: *Patents, Oily water, *Oil wastes, *Waste water treatment, Resins, *Ion exchange, Industrial wastes, *Pollution abatement, Water quality control, Water pollution control, Chemical reactions.
Identifiers: *Oleophilic resins, Organic ions, Chemical treatment.

Waste water is passed through a column containing oleophilic resin and the treated water is then removed from the resin. The oleophilic resin can be an ion exchange resin; the oleophilic properties are imparted to it by organic ions fixed on it. An ion-exchange operation can be conducted concurrently with the de-oiling process. (Sinha-OEIS)
W73-11226

WATER PURIFICATION WITH POROUS ABRASIVES,
Norton Co., Troy, N.Y. (assignee)
S. Eisner, and C. H. Rowe.
U. S. Patent No. 3,728,255, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 1054, April 17, 1973.

Descriptors: *Patents, *Water purification, *Aeration, Oxygenation, *Microorganisms, *Waste water treatment, Water quality control, *Pollution abatement, Potable water, Water pollution control.
Identifiers: Hydrogen peroxide.

A porous abrasive belt, disc or drum aerates the water. The belt has a porous backing, preferably made of a foam material which is resilient and is able to alternately soak up water and air and then discharge either when squeezed in the presence of the opposite phase. The belt is rotated so there is always a portion in the water and a portion in the air. Being squeezed out the water cascades back into the body of water. In addition to aerating the water the abrasive of the belt can be used to generate nascent oxygen and hydrogen peroxide by being made to rub against and abrade quartz, aluminum, zinc, silica or other materials known to produce nascent oxygen or hydrogen peroxide. (Sinha-OEIS)
W73-11228

ACCELERATED BIOLOGICAL-CHEMICAL WASTEWATER TREATMENT,
California Univ., Berkeley. (assignee)
W. J. Kaufman.
U. S. Patent No. 3,728,253, 3 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 1054, April 17, 1973.

Descriptors: *Patents, *Phosphates, *Waste water treatment, *Biological treatment, Organic wastes, Pollution abatement, Water quality control, *Aeration, *Flocculation, Lime, Suspended solids, *Water pollution control, *Biochemical oxygen demand.
Identifiers: Clarification, Organic nitrogen, *Chemical treatment, Gravity settling, Alum.

This process uses as a first stage a biological system having an aerator and a sludge separator to remove soluble and colloidal organic materials, and as the second stage, a chemical system having a flocculator and a separator-clarifier adapted to remove phosphorus, along with suspended solids and some soluble organic compounds. Lime, alum or other floc-generating chemicals may be used. Solids formed in the second stage are recycled from the separator-clarifier to the first stage aerator in amounts sufficient to maintain the content of inorganic suspended solids at between 30-60 percent by weight of total suspended solids. There is a resulting high degree of removal of organic nitrogen and phosphates. (Sinha-OEIS)
W73-11229

APPARATUS FOR TREATING SEWAGE,
Cole Resedevel Corp., Fairlawn, N. J. (assignee)
W. R. Preis, and W. Cole.
U. S. Patent No. 3,728,245, 4 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 1052, April 17, 1973.

Descriptors: *Patents, *Electrolysis, Bacteria, Oxidation, Chlorides, Oxides, Chemical reactions, *Flocculation, Color, Odor, *Ionization, *Waste water treatment.
Identifiers: *Chemical treatment, Sodium hydroxide.

A two-stage separator cell is provided. In the first, laminar flow of the liquid is effected and electrical energy introduced into the liquid. The treatment results in the separation of certain salt and water ions to produce free ions and, through a chemical reaction, sodium hydroxide. The sodium hydroxide causes a breakdown of fatty and oily substances into less complex settleable particles while the oxygen and chloride attack living organisms and colors and odors to cause a bleaching action and to oxidize bacteria. In the second stage of the cell, any existing residual ionization is cancelled out with a resultant rapid separation and flocculation of the solids existing in the solution with the aid of certain oxides and chlorides. (Sinha-OEIS)
W73-11231

SKIMMING DEVICE FOR USE ON A LIQUID SURFACE,
Gulf Oil Corp., Pittsburgh, Pa. (assignee)
J. L. Henning, Jr., and W. J. Robicheaux.
U. S. Patent No 3,727,765, 3 p, 3 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 937, April 17, 1973.

Descriptors: *Patents, *Skimming, *Oil wastes, Oily water, *Waste water treatment, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, *Separation techniques, Equipment.

Skimming apparatus for removal of oil from the surface of settling ponds is discussed. A skimmer trough extends between and is supported by a pair of spaced floats. The skimmer trough is adjustable vertically on the floats to adjust the elevation of the upper edge of the trough relative to the floats, and thereby, the initial submergence of the overflow edge. A drain line from the lower end of the trough delivers liquid flowing into the trough to a sump from which the liquid is pumped from the system. An air bubbler line opens into the lower part of the skimmer trough and sends a signal responsive to the depth of oil in the trough to control the opening of the valve in the discharge line. (Sinha-OEIS)
W73-11233

WATER DECOMPOSITION APPARATUS,
World Water Resources, Inc., New York. (assignee).
For primary bibliographic entry see Field 05F.
W73-11234

PURIFICATION OF WASTE WATER,
Grace (W. R.) and Co., New York.
C. C. Legal, Jr.
U.S. Patent No 3,725,265, 6 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: *Patents, *Fluorides, *Phosphates, Sulfate, Calcium, *Waste water treatment, *Water

purification, Water treatment, Chemical reactions, *Acidic water, Precipitation, Pollution abatement, Water quality control, Water pollution control.
Identifiers: *Chemical treatment.

The process for purifying an acidic waste water that contains fluoride, phosphate, calcium, and sulfate ions, and silica consists of the following steps. Ca (OH)2 solution is added to the waste water. The resulting precipitate calcium fluoride is removed leaving a first filtrate. Then Ca (OH)2 is added to the filtrate bringing the pH to 6.5 to 8.5. The second precipitate contains calcium phosphates as a major component. The second precipitate is removed and the purified water remains. The purified water contains only about 2 - 10 ppm fluoride ions and about 30 - 80 ppm phosphate ions. Eight examples are cited. (Sinha-OEIS)
W73-11238

ACTIVATED SLUDGE SEWAGE TREATMENT PROCESS AND SYSTEM,
Air Products and Chemicals, Inc., Allentown, Pa. (assignee)
M. L. Spector, R. D. Jones, and C. S. McDowell.
U. S. Patent No. 3,725,258, 5 p, 4 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 312, April 3, 1973.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, *Aeration, Dissolved oxygen, Pollution abatement, Water quality control, Water pollution control, *Waste water treatment.

The activated sludge sewage treatment process and system includes an initial closed aeration chamber into which mixed liquor, comprising aqueous waste and recycled sludge, is aerated in contact with an oxygen-rich aeration gas; the phrase 'oxygen-rich aeration gas' being defined as an aeration gas comprising at least 35% oxygen, by volume, and preferably 50 to 99.9% oxygen by volume. In at least the first portion of this enclosed aeration chamber, the dissolved oxygen content of the mixed liquor is maintained at a relatively high level such as between 3 and 15 ppm, and preferably between 5 and 10 ppm. After the aeration period in the closed chamber in contact with the oxygen-rich aeration gas, the mixed liquor is discharged into one or more open aeration chambers wherein further aeration is accomplished with atmospheric air at relatively lower dissolved oxygen levels until the purification process is completed to the desired degree. (Sinha-OEIS)
W73-11239

ACTIVATED SLUDGE PROCESS AND SYSTEM,
Air Products and Chemicals, Inc., Allentown, Pa. (assignee).
R. E. McKinney.
U. S. Patent No 3,724,667, 6 p, 1 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 179, April 3, 1973.

Descriptors: *Patents, *Aeration, *Activated sludge, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control.

Waste to be treated is first placed in the primary sedimentation tank and held there to permit settling of solids. The effluent is then passed to the aeration chamber where it is aerated and mixed with the liquor in the chamber. The waste to be treated is also mixed in the chamber with sludge which is recirculated from the secondary sedimentation tank. The sludge from the secondary tank provides the seed microorganisms to build up the activated sludge in the aeration chamber. The efficiency of oxygen transfer is greater with aerated droplets than with bubbles of gas which are diffused through the mixed liquor. The gas is injected under a pressure greater than atmospheric and the gas in the upper region is maintained at a pressure greater than atmospheric. (Sinha-OEIS)
W73-11240

TERTIARY FILTERING ARRANGEMENT,
S. Boorujy.
U. S. Patent No 3,722,681, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 967, March 27, 1973.

Descriptors: *Patents, Pollution, *Tertiary treatment, *Filtration, *Waste water treatment, Water quality control, Water pollution control, Biochemical oxygen demand.
Identifiers: *Newsprint.

By this filtering arrangement, sewer effluent should be made suitable for discharge into rivers or streams. Suitably prepared waste newsprint may be utilized to remove suspended particulate matter from sewer water that has undergone secondary treatment. The processed newsprint is introduced into the sewage at the rate of 100 to 200 pounds to one million gallons of sewages that 95% of the BOD will be removed at a rate sufficient to meet the practical demands of a functioning disposal system. A filter element and a special scraper for cleaning the filter are provided. The scraper is apertured to permit the collected debris to enter within the scraper and the inside of the scraper is connected to a ventable line. The pressure developed by the cleaned liquid on the inside of the filter suffices when the ventable connection is made to force the cleaned water back through the filter flushing off debris from the outside of the filter. (Sinha-OEIS)
W73-11241

APPARATUS FOR HANDLING SEWAGE,
R. I. Fletcher.
U. S. Patent No 3,720,320, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 908, No 2, p 362, March 13, 1973.

Descriptors: *Patents, *Sewage treatment, *Aerobic treatment, *Waste water treatment, Equipment, Pollution abatement, Water quality control, Water pollution control.

The apparatus is a horizontal, rotating, continuous-feed, multipass digester which is made up of a large horizontal cylinder which is designed to rotate about its horizontal axis. Oxygen, air or other gases are introduced under pressure. There are an odd number of concentric cylinders or tapered cylinders which run the length of the main cylinder. A flow through system makes this a compact arrangement which can be carefully regulated as to temperature, movement and gas content. (Sinha-OEIS)
W73-11242

EMERGING WATER SUPPLY TECHNOLOGY.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 03D.
W73-11246

COMPREHENSIVE WATER SEWER PLAN FOR BALDWIN COUNTY, ALABAMA.
Polyengineering, Mobile, Ala.

South Alabama Regional Planning Commission, Mobile, November, 1969. 218 p, 39 fig, 32 tab. HUD ALABAMA P (57) G.

Descriptors: *Planning, *Water supply, *Sewerage, *Storm sewers, Financing, Project planning, Utilities, *Alabama.
Identifiers: *Baldwin County (Ala), Inventories, Utility extension.

Twenty-seven towns and communities in Baldwin County are analyzed in terms of their water and sewer systems and future development programs. The report consists of an introductory section which establishes various county-wide objectives, criteria, and financing methods for water and sewer expansion programs and twenty-seven separate analyses of each urban area in the county. These analyses include a short history of the community, an inventory of the existing water and sewer systems, a discussion of the adequacy of these systems, a short range water supply development program, a long range (to 1990) water plan, a short range sanitary sewer development program, a long range sanitary sewer plan, and an evaluation of the storm sewer system. The key elements of these town-by-town analyses are the short range water and sanitary sewer development programs which include priorities for specific projects, the location of the projects on numberous maps, and the estimated costs. (Elfers-North Carolina)
W73-11261

COMPREHENSIVE WATER AND SEWER PLAN FOR ESCAMBIA COUNTY, ALABAMA.
Polyengineering, Mobile, Ala.

South Alabama Regional Planning Commission, Mobile, November, 1969. 121 p, 20 fig, 20 tab. HUD Alabama P (57) G.

Descriptors: *Planning, *Water supply, *Sewerage, *Storm sewers, Financing, Project planning, Utilities, *Alabama.
Identifiers: *Escambia County (Ala), Inventories, Utility extension.

The basic approach of this detailed analysis and development program is one of looking at each town or community in the county separately. Thus, there are fifteen self-contained chapters each covering one town and each including a short history of the town, an inventory of the existing water and sewer systems, an analysis of the adequacy of these systems, a short range water supply development program, a long range water plan (to 1990), a short range sanitary sewer development program, a long range sanitary sewer plan, and a storm sewer analysis. The key features of these chapters are the short range water and sanitary sewer development programs which include priorities for specific projects, cost estimates, and detailed maps showing the projects. The town-by-town analyses are preceded by an introductory section which discusses overall county goals and objectives, standards and criteria, and financing methods. (Elfers-North Carolina)
W73-11262

METAL TOXICITY TO SEWAGE ORGANISMS, A DISCUSSION,
Illinois Univ., Urbana. Dept. of Civil Engineering.
M. Chaudhuri, and R. S. Engelbrecht.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA6, p 944-945, December 1971. 3 ref.

Descriptors: *Activated sludge, *Fungi, *Heavy metals, *Toxicity, *Inhibition, *Growth rates, Sanitary engineering, Sewage treatment, Aerobic bacteria, Absorption, Copper, Silver, Nickel, Environmental effects, Enzymes, Waste water.
Identifiers: *Geotrichum candidum.

This article discusses a paper by Calvin P.C. Poon and Kiran L. Bhayani which was published in April 1971 (See W71-10313). Lack of information regarding the growth phase of cultures and presence of complexing agents severely limits the practical applicability of the data presented; and a more appropriate parameter of active biomass should be used. It is suggested that a careful monitoring of heavy metal concentrations and the factors favoring the growth of Geotrichum candidum over the normal population of activated sludge for

an extended period in an operating treatment plant would provide a better insight into this problem. (Jerome-Vanderbilt)
W73-11266

RECOVER ZINC FROM ZINC ASH,
Pacific Smelting Co., Torrance, Calif.
W. P. Reummler.
Chemical Engineering, Vol 97, No 13, p 70-71, June 12, 1972. 1 fig.

Descriptors: *Separation techniques, *Zinc, *Chlorides, *Waste treatment, Chemical engineering, Metals, Absorption, Chemical reactions, Drying, Salts, Reduction (Chemical), Evaluation, Testing, Industrial wastes.

A unique zinc-recovery operation incorporates novel zinc chloride treatment steps that cut down on the problem of clogging of baghouse filters, because of zinc chloride moisture adsorption. The zinc ash treatment involves three basic operations, milling and metallic separation of zinc and zinc oxide, metallic zinc recovery, and crude zinc oxide treatment. In the oxide treatment step a neutralization reactor has been added to react soda ash with zinc chloride. The resulting zinc carbonate is converted to zinc oxide which yields metallic zinc upon milling. (Jerome - Vanderbilt)
W73-11281

CURTAILING POLLUTION FROM METAL FINISHING,
Industrial Filter and Pump Mfg. Co., Cicero, Ill.
J. F. Zievers, and C. J. Novotny.
Environmental Science and Technology, Vol 7, No 3, p 209-213, March 1973. 1 tab, 3 fig, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Design criteria, Waste disposal, Heavy metals, Phenols, Phosphates, Hydrogen ion concentrations, Toxins, Oil, Separation techniques, Reverse osmosis, Filtration, Chemical reactions, Evaporation, Ion exchange, Sedimentation, Aeration, Cost analysis, Estimated costs.
Identifiers: *Metal finishing wastes.

Wastes produced during metal finishing operations, the various procedures used in the treatment of these wastes and the cost of these different methods are discussed. The seven major pollutants produced during metal finishing operations are; cyanides, hexavalent chromium, pH fluctuations, oil, heavy metals, phenols, and phosphates. Six procedures can be followed to result in the smallest treatment plant possible handling the least possible quantity of wastes. These are: housekeeping to avoid unnecessary spills, mixes and process losses; segregation of different waste components for easier treatment; proper scheduling for the most efficient treatment; reduction of effluent volume by countercurrent rinses; reduction of the intensity of the wastes by changing plating baths used; and changes in the chemistry of the process. Twelve commonly used waste treatment processes discussed are: dilution, containment, chemical conversion, combustion, evaporation or reverse osmosis, ion exchange, deep-well disposal, sedimentation, clarification, aeration, filtration and combination. A discussion of treatment cost includes capital cost, operating cost and the possibility of material recovery. (Jerome - Vanderbilt)
W73-11283

CHLORINE MAKERS CLUTCH AT LAST DROPS OF MERCURY.

Chemical Week, Vol 108, No 8, p 75-77, February 24, 1971.

Descriptors: *Waste water treatment, *Mercury, Pollution abatement, Water pollution, *Industrial wastes, Industrial production, Chemical wastes, Chlorine.
Identifiers: *Chlor-alkali industry.

According to the Chlorine Institute the chlorine industry has reduced by more than 95% the mercury in its liquid waste effluent since the problems of mercury discharge have become clear. Thus far some 20 million dollars have been spent for treatment. In general mercury leaves the mercury cells of a chlorine plant primarily in the hydrogen, caustic and chlorine streams. These streams are recycled where possible. The remainder are treated. Some measures presently taken by domestic industries are described. These include the sulfide treatment and iron flocculation which yield effluents with mercury in the range of 100-300 ppb. Other methods include Monsanto's Brink mist eliminators used to remove mercury from vent gas streams, Bayer's catalytic approach, N. J. Zinc's zinc dust mercury precipitation, Osaka Soda reuse method, and methods based on redesign of cells. (Oleszkiewicz - Vanderbilt)
W73-11288

WATER SUPPLY IMPROVEMENTS FEATURE NEW COAGULATOR,
Crew (Alfred), Ridgewood, N.J.
For primary bibliographic entry see Field 05F.
W73-11315

PHOSPHORUS REMOVAL, A BIBLIOGRAPHY, VOLUME I.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 477, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-208, May 1973, 275 p.

Descriptors: *Bibliographies, *Eutrophication, *Nitrogen, *Nutrient removal, *Phosphates, *Waste water treatment, Activated sludge, Biological treatment, Industrial wastes, Phosphorus compounds, Sewage treatment, Sludge treatment, Tertiary treatment, Water reuse, Filtration, Farm wastes, Oxidation lagoons.
Identifiers: *Phosphorus removal.

This report, containing 175 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published through 1969. Author and subject indexes are included. (See also W73-11320) (OWRR)
W73-11319

PHOSPHORUS REMOVAL, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 478, $6.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-208, May 1973, 465 p.

Descriptors: *Bibliographies, *Eutrophication, *Nitrogen, *Nutrient removal, *Phosphates, *Waste water treatment, Activated sludge, Biological treatment, Industrial wastes, Phosphorus compounds, Sewage treatment, Tertiary treatment, Water reuse, Filtration, Farm wastes, Oxidation lagoons.
Identifiers: *Phosphorus removal.

This report, containing 317 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published in 1970-1972. Author and subject indexes are included. (See also W73-11319) (OWRR)
W73-11320

BIOLOGICAL REMOVAL OF CARBON AND NITROGEN COMPOUNDS FROM COKE PLANT WASTES,
American Iron and Steel Inst., New York.
J. E. Baker, and R. J. Thompson.
Copy available from GPO Sup Doc as EP1.23/2:73-167, $2.35; microfiche from NTIS as PB-221 485, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-167, April 1973. 178 p, 9 fig, 23 tab, 65 ref. EP A Project 12010 EDY.

Descriptors: Aerobic conditions, Anaerobic condition, Biochemical oxygen demand, Heated water, Industrial wastes, *Nitorgen compounds, Organic matter, Phenols, *Biological treatment, *Waste water treatment, *Carbon, Activated sludge, Pilot plants.
Identifiers: *Coke plant wastes, Ammonia liquor, Nitrification, Denitrification.

A one-year study of a biological process for treatment of coke plant ammonia liquor was conducted. The process was designed to remove carbon compounds and ammonia. The pilot plant consisted of three treatment systems arranged in series. These systems were designed for the removal of carbon compounds, the oxidation of ammonia to nitrate (nitrification), and the reduction of nitrate to nitrogen gas (denitrification). The study was jointly sponsored by the American Iron and Steel Institute, the Environmental Protection Agency, and Armco Steel Corporation. The results of the study indicate that the biological process can be used to remove carbon compounds and ammonia from dilute ammonia liquor. Treatment efficiencies obtained include removals of greater than 99.9 percent phenol, 80 percent COD, and 90 percent ammonia. Removal efficiencies for cyanide and thiocyanate were less encouraging with averages of 57 and 17 percent, respectively. (EPA)
W73-11328

DYESTUFF COLOR REMOVAL BY IONIZING RADIATION AND CHEMICAL OXIDATION,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
T. F. Craft, and G. G. Eichholz.
Copy available from GPO Sup Doc as EP1.23/2:73-048, $2.10; microfiche from NTIS as PB-221 486, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-048, March 1973. 118 p, 66 fig, 2 tab, 32 ref. EPA Project 12090 FZB.

Descriptors: Dyes, *Gamma rays, *Oxidation, *Waste water treatment, Industrial wastes, Color.
Identifiers: *Dye industry wastes, *Textile finishing wastes, Gamma radiation, Chemical oxidation, *Color removal.

The effects of a combined radiation-oxidation process on solutions of textile dyes have been studied. The combined treatment with gamma radiation and chlorine causes more decolorization than the effect of the two components when they are applied individually. Several chemical classes of dyes were tested, including anthraquinone, azo, metallized azo, sulfur, stilbene, and triphenylmethane dyes. At a concentration of 0.25 g/l the transmittance at the wave-length of maximum absorbance of dye solutions is greatly increased by treatment with a radiation dose of 60 kR plus 75 ppm chlorine. Non-optimized cost estimates indicate $0.31/1000 gal. for design treatment, with normal operating costs potentially lower. Although the major benefit from this treatment will be

removal of color, some reduction of chemical oxygen demand will occur, and possibly some reduction in the biochemical oxygen demand. (EPA)
W73-11329

LOW WATER VOLUME ENZYME DEACTIVATION OF VEGETABLES BEFORE PRESERVATION,
National Canners Association Research Foundation, Calif.
J. W. Ralls, and W. A. Mercer.
Copy available from GPO Sup Doc as EP1.23/2:73-198; $1.25; microfiche from NTIS as PB-221 511, $0.95. Environmental Protection Agency, Technology Series EPA-R2-73-198, May 1973. 88 p, 5 fig, 25 tab, 18 ref. EPA Project 12060 PAV.

Descriptors: *Food processing industry, *Waste water treatment, Microwave, Steam, *Pilot plants, Costs.
Identifiers: *Canning (Food processing), *Blanching, Microwave blanching, Steam blanching, *Vegetable wastes, Food processing wastes.

Four pilot-plant units were operated with asparagus, peas, corn, beans, beets, pumpkin and spinach to establish the potential for new blanching systems with low wastewater generation. The systems investigated were microwave, hot-gas, steam, and hot-water. Single runs of about one hour duration were made for each commodity with each blanching system. Wastewater volume was measured and samples were analyzed for COD, SS, and pH. The most striking result obtained was the small volume of steam condensate formed during hot-gas blanching. Canned samples of vegetable material from each blancher were prepared for quality evaluation after storage. Tast panels showed no significant flavor preference for samples from any individual blanching system. The system used had no significant effect on the vitamin and mineral retention of blanched or canned samples. The oxygen content of canned samples was lowest for hot-gas blanching compared to the other three systems. Estimates of the cost of blanching using commercial-scale units gave (dollars/ton blanched): microwave, 18.47; hot-gas, 3.39; steam, 2.21; and hot-water, 2.36. (EPA)
W73-11330

ECONOMIC FEASIBILITY OF MINIMUM INDUSTRIAL WASTE LOAD DISCHARGE REQUIREMENTS,
Datagraphics, Inc., Pittsburgh, Pa.
Henry C. Bramer.
Copy available from GPO Sup Doc as EP1.23/3:73-016, $2.10; microfiche from NTIS as PB-221 490, $0.95. Environmental Protection Agency, Socioeconomic Studies Series Report, EPA-R5-73-016, April 1973. 118 p, 19 fig, 66 tab, 24 ref. EPA Contract 2800775, Project 68-01-0196.

Descriptors: *Economics, *Industrial wastes, Costs, *Waste water treatment, Treatment facilities, Waste disposal, *Cost analysis.
Identifiers: *Treatment costs, *Zero discharge requirement.

Order-of-magnitude estimates of the costs of implementing minimum and zero discharge requirements for the manufacturing and electric power industries are presented. The analysis was made, for the most part, at the 2 digit S.I.C. level for the manufacturing industries. The assumed technology was maximum in-plant recirculation and reuse, concentration of the recirculation blowdown by evaporation, and final residual disposal by the applicable least-cost method among incineration, deepwell disposal, solar evaporation, and ocean disposal. It is concluded that a strict zero discharge requirement would have greatly variable and significant economic consequences, but that less stringent definitions of minimum discharge would be feasible. The limiting factors in applying a strict zero discharge requirement appear to be the availability of physical resources, particularly energy, for purposes of effluent concentration. (EPA)
W73-11335

ULTRA HIGH RATE FILTRATION OF ACTIVATED SLUDGE PLANT EFFLUENT,
Hydrotechnic Corp., New York.
R. Nebolsine, I. Pouschine, and C-Y. Fan.
Copy available from GPO Sup Doc as 1.23/2:73-222, $2.10; microfiche from NTIS as PB-221 492, $0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-73-222, April 1973. 114 p, 15 fig, 20 tab, 13 ref. EPA Project 17030 HMM.

Descriptors: *Separation techniques, *Tertiary treatment, *Filtration, *Activated sludge, Coagulation, *Waste water treatment, *Ohio, Polymers.
Identifiers: *Cleveland (Ohio), Alum, Polymer, Dual-media, Ultra-high rate, Variable studies.

Pilot plant studies were conducted at the Southerly Wastewater Treatment Plant in Cleveland to evaluate the capabilities of the deep bed, dual media, ultra high rate filtration process for treating an activated sludge plant secondary effluent. The various operating variables that were treated and evaluated, included different media sizes, sizes, various depth, bed, filtration rates from 8 to 32 gpm/sq ft, different types of polymer, and different combinations of coagulants and polymers. The principal parameter for evaluating process efficiency was suspended solids. High removals were obtained with respect to suspended solids and to pollutants associated with suspended solids. The removal of these pollutants reduced biochemical oxygen demand, chemical oxygen demand and total phosphate values. Capital costs for a filtration process of this type as estimated to range from $1,200,000 for a 25 MGD plant to $5,400,000 for a 200 MGD plant. Total treatment costs, including capital and operating charges, are estimated to be 4.32-2.97 cents/1000 gallons for the 25 and 200 MGD plants respectively. (EPA)
W73-11337

SECONDARY WASTE TREATMENT FOR A SMALL DIVERSIFIED TANNERY,
Caldwell Lace Leather Co., Auburn, Ky.
E. L. Thackston.
Copy available from GPO Sup Doc as EP1.23/2:73-209, $1.25; microfiche from NTIS as PB-221 494, $0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-73-209, April 1973. 75 p, 13 fig, 24 tab, 30 ref. EPA Project 12120 EFM. WPRD 25-01.

Descriptors: *Waste water treatment, *Activated sludge, *Industrial wastes, Testing, Evaluation, Laboratory tests, Sampling, Settling basins, Chemical oxygen demand, Biochemical oxygen demand, *Kentucky.
Identifiers: *Tannery wastes, Leather production.

The Caldwell Lace Leather Co. of Auburn, Kentucky, a small tannery using primarily alum tanning but some chrome and vegetable tanning, receiver a demonstration grant in 1967 from the FWPCA to investigate and demonstrate methods of treating tannery wastes for discharge to a small stream. A research contract with Vanderbilt University produced findings which have previously been reported and are reviewed herein. A modified completely-mixed activated sludge plant was constructed, along with facilities to handle specific problem wastes. After it had been operating for a year an EPA survey team conducted a study which showed that the plant was performing as predicted by the research phase, except for solids carryover from the secondary clarifier due to mechanical problems. After the problems were corrected, the plant began producing an effluent which more than met expectations, removing 97% of the suspended solids and 95% of the BOD. Due to conservation measures inside the tannery, however, the load on the plant is somewhat less than the design load, so the plant is operating as an extended aeration plant. (EPA)
W73-11340

ACTIVATED CARBON FOR WATER TREATMENT,
West Virginia Pulp and Paper Co., Tyrone, Pa. Chemical Div.
For primary bibliographic entry see Field 05F.
W73-11352

SLUDGE CONCENTRATION,
Polymer Corp. Ltd., Sarnia (Ontario). (assignee)
R. C. MacKenzie.
U.S. Patent No 3,729,412, 3 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1354, April 24, 1973.

Descriptors: *Patents, Liquid wastes, *Polymers, *Sludge treatment, *Secondary treatment, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Latex.

A process is provided for the concentration of solids of a sludge derived from waste water. It comprises mixing (a) an aqueous sludge containing at least 0.5 weight percent of suspended solids, the solids being substantially polymeric material, with (b) a latex containing more than about 0.5 weight percent of rubbery polymeric solids and (c) a coagulating agent selected from the mineral acids, calcium chloride and aluminum chloride. An isolatable coagulum is formed containing the suspended polymeric material and the rubbery polymeric solids. The coagulum is separated from the aqueous phase; the separated coagulum contains at least 25 weight percent solids. (Sinha-OEIS)
W73-11357

APPARATUS FOR SEPARATING POLLUTANTS AND OBTAINING SEPARATE LIQUIDS AND SOLIDS,
Pollutant Separation, Inc., Elmwood, Conn. (assignee)
H. J. Burnett.
U. S. Patent No 3,729,042, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1265, April 24, 1973.

Descriptors: *Patents, Equipment, Separation techniques, Slurries, *Sewage treatment, *Municipal wastes, *Waste water treatment, Water pollution control, Water quality control, Solids, Pollution abatement.

The apparatus consists of a sewage receiving tank, a collecting tank, and a grinding pump. The sewage is ground into a slurry and transferred to the collection tank. There is a condensate receiving tank and a vapor condensing tank, as well as a closed high pressure surge tank, an electric transformer, and a series of connected pipe coils including one in each of the condensate receiving and condensing tanks. A high pressure pump forces slurry from the collecting tank through the pipe coils into the surge tank where it is subjected to high temperatures. The heated slurry is moved to the low pressure in the vaporizing chamber where vaporization of the liquids in the slurry takes place. The condensate from the vapors of the slurry are discharged so as to preheat the incoming slurry passing through the pipe coils leading to the area where they are heated to high temperatures. (Sinha-OEIS)
W73-11359

GENERIC FEED FORWARD CONTROL OF ACTIVATED SLUDGE,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
J. J. Davis, R. I. Kermode, and R. W. J. Brett.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, Proceedings paper 9803, p 301-314, June, 1973. 5 fig, 4 tab, 9 ref.

Descriptors: *Activated sludge, *Simulation analysis, *Digital computers, *Optimization, *Sewage treatment, *Environmental engineering, Water quality, Streams, Equations, Mathematical models, Systems analysis.
Identifiers: *Feed forward control.

Feed forward controllers for the completely mixed activated sludge process have been developed and tested by computer simulation against the sludge growth rate models of five authors. Control is effective for all models and is shown to apply generally to growth models wherein specific growth rate is any function of substrate concentration. The control strategy involves manipulation of the recycle rate of return sludge. When the recycle rate is under proportional control from measurement of influent flow rate and derivative control from measurement of influent substrate concentration, soluble substrate in the effluent is minimized and stabilized. With recycle sludge storage, control is more effective. (Bell-Cornell)
W73-11362

MULTILEVEL CONTROL OF MULTIPOLLUTANT SYSTEM,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
For primary bibliographic entry see Field 05G.
W73-11363

PRESERVATION OF LAKE BAYKAL (OB OKHRANE OZERA BAYKAL),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 05C.
W73-11407

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION - PHASE I,
California Univ., Riverside. Dept. of Plant Sciences.
J. R. Goodin, and W. D. Kesner.
Available from the National Technical Information Service as PB-221 534, $3.00 in paper copy, $0.95 in microfiche. California Water Resources Center Technical Completion Report, 1972. 37 p, 8 fig, 7 tab. OWRR B-090-CAL (1), 14-31-0001-3058.

Descriptors: Sewage effluents, Groundwater, *California, *Waste water disposal, *Water reuse, Irrigation systems, Vegetation.
Identifiers: *Maloney Canyon (Calif), Lake Arrowhead (Calif), San Bernardino National Forest, *Greenbelts, Firebreaks.

A cooperative project between US Forest Service, University of California, Lake Arrowhead Sanitation District and San Bernardino County Flood Control District studied greenbelts irrigated with sewage effluent as a new and perhaps less costly means of reducing wildfire hazards, while disposing of waste water and recharging groundwater reservoirs in the mountain regions. Phase I covers site selection in Maloney Canyon, San Bernardino National Forest, as a controlled field location. Natural flora and fauna inventoried; contour mapping completed; surveying; construction of access roads and jeep trails; planning of irrigation system and construction of study plots are reputed. (See also W73-06525 and W73-06526)
W73-11424

A DYNAMIC PROGRAMMING APPROACH FOR INVESTMENT STRATEGIES IN WASTEWATER TREATMENT PLANTS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. M. Armstrong.
Available from the National Technical Information Service as PB-221 646, $4.85 in paper copy, $0.95 in microfiche. Project Completion Report, East Lansing, Michigan State University, Institute of Water Research, March 1973. 71 p, 25 fig, 7 ref. 3 append. OWRR-A-036-Mich (1), 14-31-0001-3022.

Descriptors: *Waste water treatment, *Investment, Management, *Treatment facilities, Planning, Model studies, Decision making.

The transport of waste materials has long been considered an acceptable use of water. The general rule has been to capture the water, put it to use, and then discard it with only a minimal level of treatment. The level of treatment has been based on what is needed to prevent, or keep to an acceptable minimum, nuisance and damages to downstream users of the receiving body. This practice has been the result of the attitude that water has very little value in and of itself. The inherent characteristics of water investments make it necessary to formulate plans and decisions based on a future of twenty years or longer, but there is no 'one future' on which to base the decision. An attempt is made to develop a management tool which will aid the decision maker in evaluating the many alternatives available to him. A mechanism is needed which will provide the decision maker with the best investment strategy for any given set of assumtions about the future and must be able to accomplish the task quickly and at a minimal cost. The model generates the optimal capacity schedule within its limited discrete universe. Solutions agree with the analytical expectations for simple demand curves of linear or geometric shape. The model provides a cheap and convenient means of exploring alternate futures in actual decision making situations. At the least, it provides some method of calculating the cost of forecasting errors. The model has the potential, with some refinement, to become a component in a regional decision model.
W73-11426

NATIONAL MEAT-PACKING WASTE MANAGEMENT RESEARCH AND DEVELOPMENT PROGRAM,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
J. L. Witherow, S. C. Yin, and D. M. Farmer.
Copy available from GPO Sup Doc as EP1.23/2:73-178, $0.75; microfiche from NTIS as PB-221 546, $0.95. Environmental Protection Technology Series Report EPA-R2-73-178, March 1973. 33 p, 10 fig, 3 tab, 13 ref. EPA Project 12060 FGF.

Descriptors: *Industrial wastes, *Waste water treatment, Water pollution sources, *Water pollution control, Canneries, Research priorities, *Water resue, *Management.
Identifiers: *Meat-packing wastes, *Research programs, Food processing wastes.

The meat-packing process is viewed from the standpoint of its use and discharge of water. The concept of integrated water managment through in-plant control, solids recovery and disposal, wastewater treatment, and water reuse is presented. The necessity for in-plant change in unit processes and housekeeping practices to reduce waste loads is shown by the wide variation in discharges from similar plants. The scope of the meat industries' waste management problem is defined, and the objectives of the National Meat-Packing Waste Management Research Program are categorized. Environmental Research Need Statements are introduced as a means by which the meat industry can present its waste treatment problems to the program. The past and current research projects are briefly described according to objectives and accomplishments with more detailed information referenced. The results of the recent waste survey of the meat industry are given along with interpretation of their meaning. Future research projects will evolve around closed-loop technology. Unit processes which offer great potential in waste reduction are described as the initiation point for a program to reach the goal of 'no discharge of pollutants.' (EPA)
W73-11440

A FLOW PROPORTIONAL COMPOSITE SAMPLER,
Wisconsin State Univ., Platteville.
For primary bibliographic entry see Field 05A.
W73-11463

WASTEWATER MANAGEMENT THROUGH LAND UTILIZATION - MUSKEGAN COUNTY, MICHIGAN, USA,
Environmental Protection Agency, Washington, D.C.
J. A. Krivak.
Paper, Int Symp Plann Water Resour, Mexico City, Mexico, Dec 1972. 28 p, 2 fig, 1 tab, 26 ref.

Descriptors: *Water reuse, *Sprinkler irrigation, *Environmental effects, Soical impact, Evaluation, Wastewater disposal, Research and development, Waste water (Pollution), Bibliographies, Sewage, Economic impact, Agriculture, Reclaimed water, Industrial wastes, Water quality.
Identifiers: *Environmental quality, Environmental evaluation, Land-use practices, Groundwater quality, Irrigation reuse, Effluent reuse.

Waste water reclamation provides an opportunity for increasing water supplies in many areas. Interest has been renewed in planning and development of land utilization systems as a means of eliminating pollution and providing beneficial water use. The project described, in Muskegon County, Michigan, will initially use reclaimed water to spray-irrigate 6,000 acres of agricultural land. This disposal system, to be operational in the summer of 1973, will be fully tested and evaluated in an urban area. The project encompasses a 501-sq-mi area and will provide waste treatment for a community of 156,000 people and 5 major industries. A continuing research program for systems monitoring and evaluation will be conducted for at least 5 yrs after the system becomes operational. Studies will include monitoring the quality of both surface and ground waters; evaluating performance of treatment components, agricultural productivity, and the social, economic, and environmental impact of the project. A brief history and different methods of applying waste waters to the land for treatment are given. (USBR)
W73-11515

CONTSTRUCTION OF A PURIFICATION PLANT FOR POLLUTED WATER USING PHOTOSYNTHETIC BACTERIA,
Kyoto Univ. (Japan). Dept. of Agricultural Research.
M. Kobayashi, M. Kobayashi, and H. Nakanishi.
J Ferment Technol. Vol 49, No 9, p 817-825. 1971. Illus.
Identifiers: Bacteria, Biochemical oxygen demand, Chlorella cells, *Photosynthetic bacteria, *Waste water treatment, *Sewage purification, Pilot plants.

This pilot plant was able to purify sewage with over 10,000 ppm Biochemical Oxygen Demand, without any dilution, for 1 wk. In this purification process, photosynthetic bacteria and Chlorella cells are harvested as by-products. This plant does not leave a sediment as is the case with an activated sludge method.--Copyright 1972, Biological Abstracts, Inc.
W73-11569

PETROLEUM HYDROCARBONS AND FATTY ACIDS IN WASTEWATER EFFLUENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-11575

MERCURY IN PUBLIC SEWER SYSTEMS,
Illinois State Water Survey, Peoria. Water Quality Section.
R. L. Evans, W. T. Sullivan, and L. Sundar.
Water and Sewage Works, Vol 120, No 2, p 74-76, Feburary 1973. 2 fig, 1 tab, 13 ref.

Descriptors: *Mercury, *Pollutant identification, *Sewerage, *Municipal wastes, Waste water (Pollution), Water quality standards, Heavy metals, Chemical analysis, Domestic wastes, Sewage effluents, Illinois, Pollutants, Water sampling, Methodology.
Identifiers: *Flameless atomic absorption spectrophotometry, Sample preservation.

A summary is presented of analyses for total mercury in a limited number of samples from raw sewages of five municipalities in central Illinois (Creve Coeur, Morton, Marquette Heights, Washington, and Peoria). At least 10 grab samples were collected in polyethylene bags from each sewer system near the intake structure of the waste treatment facilities. The samples were preserved with dilute nitric acid and analyzed for Hg using the flameless atomic absorption method of Hatch and Ott (1968). Values of total Hg concentrations found in the raw sewages ranged from 0.1 to 7.9 ppb. The geometric mean of total mercury concentrations in the five public sewer systems in central Illinois ranged from 1.3 to 1.8 ppb. Illinois standards stipulate a maximum concentration of 0.5 ppb of mercury in public sewer systems. Without lowering the existing tolerance guidelines for mercury in foodstuffs, paper products, drinking water, etc, it would appear difficult to comply with Illinois standards. There appears to be a background concentration of mercury in public sewer systems solely devoid of industrial waste influence. (Holoman-Battelle)
W73-11585

PHOSPHORUS IN WASTE WATER,
New York State Dept. of Environmental Conservation, Albany. Research and Development Unit.
L. J. Hetling, and I. G. Carcich.
Water and Sewage Works, Vol 120, No 2, p 59-62, February 1973. 3 fig, 6 tab, 45 ref.

Descriptors: *Phosphorus, *Detergents, *Waste water (Pollution), *Soaps, Chemical analysis, Water pollution sources, Domestic wastes, New York, Water sampling, Water analysis, Flow rates, Separated sewers, Nutrients, Pollutants.
Identifiers: *Pressure sewer system, Dissolved phosphorus, Pollutant removal.

A demonstration of the use of pressure sewers to determine the proportion of phosphorus contributive to domestic waste from detergents was conducted in Albany, New York, using 12 individual, single family homes connected to a pressure main via grinder-pump units. All waste water but extraneous flows (cellar, yard, and roof drainage) produced was included in the system during installation. Using a specially constructed device, a composite sample was collected daily along with complementary waste water flow data and analyzed for total and dissolved phosphorus daily for 3 weeks. A non-phosphate, heavy duty soap was then substituted in each household for the usual phosphorus detergent. Daily composite samples were collected and analyzed for a 3-week period. A 48 percent reduction of the total phosphorus was found when phosphorus free soap was used in place of phosphorus detergents. As expected, all of this decrease occurred in the soluble form. The particulate phosphorus loading remained essentially constant throughout the experiment. Removal of phosphorus from detergent washing products would lower concentrations of phosphorus in waste water from the present average of 11 mg/l to approximately 5 mg/l. (Holoman-Battelle)
W73-11592

COMPREHENSIVE REGIONAL WATER AND SEWER INVENTORY AND ANALYSIS,
Alabama-Tombigbee Rivers Regional Planning and Development Commission, Camden.
For primary bibliographic entry see Field 07B.
W73-11670

MSB COMPUTERIZED COMBINED SEWER CONTROL SYSTEM,
Metropolitan Sewer Board St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W73-11673

OZONATION OF MICROSTRAINED SECONDARY EFFLUENT,
Metropolitan Sanitary District of Greater Chicago, Ill.
D. R. Zenz, and M. J. Weingarden.
Paper presented at a symposium on Ozonation in Sewage Treatment, Wisconsin University, Department of Engineering, University Extension, Madison, November 9-10, 1971. 59 p, 20 fig, 14 tab, 15 ref.

Descriptors: *Ozone, *Sewage treatment, *Tertiary treatment, Engineering estimates, Feasibility studies, Municipal wastes, Industrial wastes, Water pollution control, Waste water treatment, Illinois.
Identifiers: Chicago.

The use of ozone in water treatment has been confined to drinking water treatment until recently. Ozonation of waste water had not been seriously studied previously because of the interference of the organic material in the waste water with the ozone. With tertiary treatment, however, much of the organic material is removed and the use of ozone may be practical. Consideration of ozone in water treatment is based on the possibility of superior treatment with ozone as compared to chlorine. It is known, for example, that ozone can reduce colors and odors that chlorine cannot reduce and, in addition, ozone can reduce substances such as oils, cyanides, phenols and other substances upon which chlorine has no effect. Certain viruses are also killed by ozone, while not killed by chlorine, and ozonation leaves no residual, breaking down to elemental oxygen. The Metropolitan Sanitary District of Greater Chicago initiated tests of ozonation to determine other effects and costs of ozone. Using a pilot plant and treating microstrained secondary effluent, the following conclusions were reached: (1) ozone is a very effective bactericide, with ozone dosages of 6.0 mg/l virtually eliminating fecal coliform, total coliform and fecal streptococcus; (2) ozone produces striking color reductions; (3) ozone dosages above 6 mg/l produced modest reductions in turbidity; (4) ozone produces a definite reduction in BOD; (5) costs for ozonation at the pilot plant were high, but considerably lower costs are predicted for full scale plants; and (6) ozone demand for satisfactory treatment appears high, and a contact time of 6 minutes was needed. (Poertner)
W73-11678

LEACHATE QUALITY FROM ACIDIC MINE SPOIL FERTILIZED WITH LIQUID DIGESTED SEWAGE SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-11680

5E. Ultimate Disposal of Wastes

GEOLOGY AND GROUND-WATER CHARACTERISTICS OF THE HANFORD RESERVATION OF THE U.S. ATOMIC ENERGY COMMISSION, WASHINGTON,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-11204

GROUND RUPTURE IN THE BALDWIN HILLS,
Earth Sciences Associates, Palo Alto, Calif.
D. H. Hamilton, and R. L. Meehan.
Science, Vol 172, No 3981, p333-344, April 1971. 12 fig, 1 tab, 14 ref.

Descriptors: *Faults (Geologic), *Injection wells, *Waste disposal, *Dam failure, *California, Oil industry, Earth dams, Rupturing, Cracks, Collapse, Reservoirs.
Identifiers: *Baldwin Hills Reservoir (Calif), Los Angeles (Calif).

December 14, 1963, water burst through the foundation and earth dam of the Baldwin Hills Reservoir, a hilltop water storage facility located in metropolitan Los Angeles. The contents of the reservoir, some 250 million gallons of treated water that had filled the artificial, 20-acre clay-and asphalt-lined basin to a depth of 70 feet, emptied within hours onto the communities below the Baldwin Hills, inundated a square mile of residences with mud and debris, and damaged or destroyed 277 homes. Since 1963 geologists and engineers have been intensively investigating this crack and several similar ones nearby all known to be surface expressions of deep, near-vertical faults of Pliestocene or greater age. That the earth-crack ground rupturing of the Baldwin Hills was genetically related to high-pressure injection of fluid into the previously faulted and subsidence-stressed subsurface seems established beyond reasonable doubt. Experience in the Baldwin Hills suggests that, although fluid injection operations may be carried out for beneficial purposes, the effects of such injection on the geologic fabric can be serious and far-reaching. (Woodard-USGS)
W73-11206

BROWN COUNTY SEWAGE AND SOLID WASTE STUDY - 1972.
Brown County Regional Planning Commission, Green Bay, Wis.

Available from the National Technical Information Service as PB-213 636, $17.75 in paper copy, $0.95 in microfiche. Brown County Regional Planning Commission, Green Bay, Wisconsin. 1972 Final Report. 313 p, 6 figs, 6 plates, 5 append. W. S. P-139 G.

Descriptors: *Planning, *Sewerage, *Solid wastes, Interceptor sewers, Timing, Administration, Projections, Landfills, *Wisconsin.
Identifiers: Brown County (Wis.), Reuse factors.

A detailed and straightforward planning approach for waste disposal in Brown County, Wisconsin, is presented. Emphasis is on the location and time phasing of interceptor sewers and the provision and operation of sanitary landfills. Each chapter describes one particular step or element of the planning process. These include physical descriptions of the drainage basins and soils, population projections, state legislation and standards, planning goals, sewage treatment technology, solid waste collection methods, waste generation factors, service areas, alternative plans, and proposed facilities. County-wide interceptor sewers are proposed and a County Sewerage Commission is recommended to administer the system. Recycling solid wastes is explored but the empha-

is is on operating landfills and incinerators to neet federal and state standards. A County Solid Vaste Authority is also recommended. (Elfers - Jorth Carolina)
V73-11250

EAD ACCUMULATION WITHIN NUCLEI OF IOSS LEAF CELLS,
Jorges Tekniske Hoegskole, Trondheim. Dept. of hysics.
I. Skaar, E. Ophus, and B. M. Gullvag.
Jature, Vol 241, No 5386, p 215-216, January 19, 973. 2 fig, 13 ref.

Descriptors: *Lead, *Mosses, *Heavy metals, Plants, *Toxicity, Air pollution, Laboratory ests, Analytical techniques, Metals, Cytological tudies.
Identifiers: Accumulation, Electron microphotog-aphy, Biological samples.

his study of accumulation of lead within vegeta-on growing near busy roads was based on the ectron scattering properties of heavy metals. Iosses were chosen for the study as they are nown to accumulate heavy metals beyond the oncentrations that are toxic for other plants. ead was detected by means of electron icrophotographs which revealed electron dense clusions in the cells from the lead-treated sam-les. Both laboratory studies and tests on field col-cted samples revealed electron dense particles ithin the nuclei, with the nuclear membrane amaged. It is believed that the electron-dense in-usions found within the nuclei of moss cells epresent lead complexes - an assumption based artly on the chemical analysis of moss leaves hich revealed about 50 ppm of lead (dry weight). Oleszkiewicz - Vanderbilt)
V73-11276

VASTEWATER MANAGEMENT THROUGH AND UTILIZATION - MUSKEGAN COUNTY, IICHIGAN, USA,
nvironmental Protection Agency, Washington, .C.
or primary bibliographic entry see Field 05D.
V73-11515

AND SPREADING, A CONSERVING AND ON-POLLUTING METHOD OF DISPOSING F OILY WASTES,
ederal Water Pollution Control Administration, incinnati, Ohio. Ohio Basin Region.
. K. Dotson, R. B. Dean, W. B. Cooke, and B. A. enner.
vailable from NTIS, Springfield, Va 22151 as B-213 749 Price $3.00 printed copy; $0.95 icrofiche. Preprint, Advances in Water Pollution esearch, Vol 1, S. W. Jenkins, editor: Pergamon ress, p II-36-1--II-36-12, 1971. 4 fig, 4 tab, 20 ref.

escriptors: *Waste disposal, *Oil industry, Land, Methodology, Soil properties, Absorption, Vater pollution control, Biodegradation.
dentifiers: *Land spreading (Oil waste).

hree land spreading operations describe different chniques of disposing oil sludge by land spread-g. The results of the investigations show that: (1) il microbes can oxidize and decompose a large uantity of petroleum hydrocarbons under a wide nge of soil and environmental conditions; (2) nd spreading is economical and comparatively olproof method of disposing of oily wastes; (3) though large additions of oil may create toxic nditions for plants, the eventual effect upon soil to improve physical and chemical properties by creasing organic matter and nitrogen content, ecreasing volume weight and increasing porosity nd moisture holding capacity; (4) natural iochemical decomposition of oil in soil may be ccelerated by judicious use of lime and fertilizer, rtificial drainage, and tillage; and (5) microbiolog-ical degradation of oily wastes takes place under a wide range of temperature, but oxidation is faster in warm or hot climates than it is in cold. (Woodard-USGS)
W73-11535

DISPOSAL OF URANIUM-MILL EFFLUENT BY WELL INJECTION IN THE GRANTS AREA, VALENCIA COUNTY, NEW MEXICO,
Geological Survey, Washington, D.C.
S. W. West.
For sale by GPO, Washington, D.C., 20402 Price $1.55. Geological Survey Professional Paper 386-D, 1972. 28 p, 6 fig, 4 plate, 8 tab, 5 ref.

Descriptors: *Waste water disposal, *Radioactive wastes, *Sulfates, *Industrial wastes, *Injection wells, Aquifer characteristics, Water analysis, Chemical analysis, Water quality, Pumping, Testing procedures, Water level fluctuations, Hydrogeology, Permeability, Well data, Cores, Path of pollutants.
Identifiers: *Uranium-mill effluent.

In Valencia County, New Mexico, the geologic and hydrologic environment in the vicinity of the Bluewater uranium mill of the Anaconda Company seems favorable for disposal of mill effluent into a deep well. Beds of sandstone in the Yeso Formation of Permian age, at depths of 950 to 1,423 feet, accept 200 to 400 gallons per minute of water under gravity flow. Water in the injection interval contained 3,900 parts per million of dissolved solids, of which 2,200 was sulfate. A thick interval of siltstone, anhydrite, and gypsum of low permeability in the upper part of the Yeso Formation separates the injection interval from the principal freshwater aquifer in the Glorieta Sandstone and the San Andres Limestone of Permian age. The disposal well was tested thoroughly during and following drilling, core samples were analyzed for porosity and permeability, and a set of geophysical logs was made to supplement other data. The well was completed by installing plastic-lined casing, cementing the annulus outside the casing, and gun perforating selected intervals of the casing. (Woodard-USGS)
W73-11551

CHEMICAL AND BIOLOGICAL QUALITY OF MUNICIPAL SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
J. R. Peterson, C. Lue-Hing, and D. R. Zeng.
Paper delivered at the Symposium on Recycling Treated Municipal Wastewater and Sludge Through Forest and Cropland, Pennsylvania State University, University Park, August 22, 1972. 16 p, 3 tab, 23 ref.

Descriptors: *Sewage sludge, *Chemical analysis, *Sewage disposal, Biological properties, Illinois, Domestic wastes, Industrial wastes, Water pollution control, Nutrients, Soil disposal fields.
Identifiers: *Chicago (Ill).

The use of sewage sludge for fertilizer or other land application demands an understanding of the sludge's chemical and physical properties. Such characteristics depend on the type and degree of waste treatment; for example, primary digested sludge has a lower nitrogen and phosphorus content than secondary digested sludge. The addition of industrial wastes to domestic wastes increases practically all chemical components except calcium. Methods of treatment by the Metropolitan Sanitary District of Greater Chicago have produced variations in pH from 6.2 for digester feed to 7.5 for lagooned wastes. Total solids varied from 3.99 percent for lagooned wastes to 99.5 percent for vacuum filtered and heat-dried wastes. Analyses of sludges from six sewage treatment plants across the nation show similar variations, some quite small; but, other analyses have shown variations of up to 45 percent. The use of sludge for land applications will depend on the chemical, biological and physical properties. Although some sludges might be acceptable chemically, others would be toxic to plant and animal life. Generally, sludges do have an excellent supply of plant nutrients available for use by the soil. They are also a good source of humus. (Poertner)
W73-11679

5F. Water Treatment and Quality Alteration

REACTOR MODEL PARAMETERS - TWO--PHASE REACTOR DESIGN TUBULAR REACTORS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
P. T. Cichy, and T. W. F. Russell.
Industrial and Engineering Chemistry, Vol 61, No 8, p 15-26, August 1969. OWRR A-008-DEL (2).

Descriptors: Oxygenation, *Mathematical models, *Mass transfer, Chemical reaction, *Pipelines, Design.
Identifiers: Reactor design.

Methods of evaluating the model parameters in the design equations for the process of mass transfer and reaction in tubular systems are presented and discussed from a design viewpoint.
W73-11138

APOLLO EXPERIENCE REPORT, POTABLE WATER SYSTEM,
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.
R. L. Sauer, and D. J. Calley.
Available from NTIS Springfield, Va 22151, NASA TN D-7291 Price $3.00 printed copy; $0.95 microfiche. National Aeronautics and Space Administration Technical Note TN D-7291, June 1973. 12 p, 2 fig.

Descriptors: *Satellites (Artificial), *Water supply, *Potable water, *Electric power, *Water storage, Methodology, Water quality, Waste water treatment, Microbiology, Bacteria, Water cooling, Sublimation, Humidity, Condensation.
Identifiers: *Manned spacecraft, Apollo spacecraft, Command module, Service module.

The design and function of the Apollo potable water system are described. The command module potable water is supplied as a byproduct of the fuel cells. The cells, located in the service module function primarily to supply electrical energy to the spacecraft. The source of the lunar module potable water is three storage tanks, which are filled before lift-off. The technique of supplying the water in each of these cases and the problems associated with compatibility of materials are described. The chemical and microbiological quality of the water is reviewed, as are efforts to maintain the water in a microbially safe condition for drinking and food mixing. (Woodard-USGS)
W73-11202

METHOD AND APPARATUS FOR DETECTING THE HARDNESS LEVEL OF WATER,
Erie Mfg. Co., Milwaukee, Wis. (assignee)
For primary bibliographic entry see Field 07B.
W73-11227

WATER DECOMPOSITION APPARATUS,
World Water Resources, Inc., New York. (assignee).
C. A. Soriano, and W. E. Hanford.
U. S. Patent No 3,727,760, 6 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 935, April 17, 1973.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality, Equipment, Potable water, Chlorination.
Identifiers: *Chemical treatment.

A flow control device is responsive to the level of the potable water supply. There is a variable hydrostatic pressure chamber having a valve which opens when the pressure in the chamber is less than the hydrostatic pressure of the water source. A pressure relief device communicates with the variable hydrostatic pressure chamber so that when the level of the potable water supply reaches a predetermined minimum, the relief device operates to reduce the hydrostatic pressure in the chamber. A conduit extends from the chamber to the water source and water is introduced into the chamber until the hydrostatic pressure of the chamber is about equal to the hydrostatic pressure of the water source. Another conduit is positioned below the water level of the lower chamber and perpendicular to the flow of water through the lower chamber, thereby creating a swirling movement in the water to assure a constant chemical dissolution rate. An example using chlorine is cited. (Sinha-OEIS)
W73-11234

SOFTENING OF SEA WATER BY ADDITION OF BARIUM CARBONATE AND CO2,
Department of the Interior, Washington, D.C. (Assignee).
P. G. Gelblum.
U. S. Patent No 3,725,267, 3 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 315, April 3, 1973.

Descriptors: *Patents, *Water softening, *Water treatment, *Scale prevention, *Distillation, Chemical reactions, *Carbon dioxide.
Identifiers: *Barium carbonate.

This invention is concerned with softening sea water prior to evaporation or distillation procedures. Barium carbonate and catalytic amounts of CO2 are added to the sea water. The barium bicarbonate which forms then reacts with sulfate and calcium. The resulting precipitate consists of barium sulfate and calcium carbonate. The softened water may then be heated to precipitate out magnesium hydroxide. (Sinha-OEIS)
W73-11236

SOFTENING OF SEA WATER BY ADDITION OF BARIUM CARBONATE AND MINERAL ACID,
Department of the Interior, Washington, D.C. (Assignee).
P. G. Gelblum.
U. S. Patent No 3,725,268, 2 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 315, April 3, 1973.

Descriptors: *Patents, *Water softening, *Scale prevention, *Desalination, *Scaling, *Water treatment, Chemical reactions.
Identifiers: Barium carbonate.

This invention provides for softening of sea water prior to evaporation or distillation to prevent scaling in the equipment. Barium carbonate and small, catalytic amounts of a mineral acid or its oxide are added to the sea water. Barium bicarbonate forms and reacts with sulfate and calcium. The precipitate with forms consists of barium sulfate and calcium carbonate. Little or no magnesium is removed from the water in this process. (Sinha-OEIS)
W73-11237

ENVIRONMENTAL HEALTH PLANNING.
Bureau of Community Environmental Management, Rockville, Md.
For primary bibliographic entry see Field 05G.
W73-11244

WATER-SOLIDS SEPARATION IN AN UPFLOW: WITH PARTICULAR REFERENCE TO USE OF A SLURRY POOL FOR SOLIDS CONTACT IN WATER TREATMENT,
A. W. Bond.
Journal of the Institution of Water Engineers, Vol 20, No 7, p 477-489, October 1966. 8 fig, 4 ref.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, Sedimentation, Coagulation, *Velocity gradient.
Identifiers: Sludge blanket, Microfloc, Solids contact, *Slurry concentration.

Properties and characteristics are described of a slurry pool in a uniformly expanding upflow solids contact basin, part of a water treatment plant, in elaboration of work carried out in a model. The plant is located at Bacchus Marsh, Victoria, Australia. Discussed are the effect of slurry production (which causes the slurry to rise) on the upflow velocity-concentration relation, the use of slurry recirculation in increasing the upflow velocity, the effects of temperature, the relation between upflow velocity and time of solids contact, the effects of variations and shock changes in the rate of upflow, the variation of slurry concentration in a uniformly expanding upflow zone, and the manner in which slurry is transferred over a slurry weir into a concentrator. (Bean-AWWARF)
W73-11313

H2S REMOVAL FROM WATER WITHOUT AIR POLLUTION,
Eglin Water Dept., Ill.
N. H. Nelson, and C. A. Jepson.
Public Works, Vol 94, No 1, p 97-98, January 1963. 1 tab.

Descriptors: *Water treatment, *Water quality, *Aeration, Oxygen, Chlorination, *Design, Odor, *Illinois.
Identifiers: Ferrous sulfate, *Hydrogen sulfide removal, Permanganate, Sulfur dioxide, Elgin (Ill).

Caught between the problems of a raw water supply with a high hydrogen sulfide content and complaints due to air pollution when the water was aerated, Elgin, Illinois, turned to precipitation of the sulfides with ferrous sulfate. The water system is served by eight wells 1,250 to 1,945 ft deep. The static and pumping levels dropped rapidly in 1958-9 and the hydrogen sulfide content increased from trace to 4 mg/l. Chlorine dosage was increased to burn up the hydrogen sulfide which greatly increased the cost. (Also, the hydrogen sulfide was destroying the concrete ceiling of the raw water chamber.) Oxidizing agents considered were oxygen, chlorine, sulfur dioxide and potassium permanganate. Oxygen would have to be applied in pure form to avoid a sweeping out effect causing air pollution. Chlorine required was 5 ppm per ppm of hydrogen sulfide. Sulfur dioxide reaction in solution at ordinary temperatures is slow. Potassium permanganate is expensive. A feeder was purchased and ferrous sulfate treatment was adopted. The dosage of 3.5 mg/l by trial and error was reduced to 2.4 mg/l. Today ferrous sulfate is not only removing 100 percent of the hydrogen sulfide from the water supply but its use has cut the amount of alum used by 50 percent and the amount of chlorine used by 25 percent. (Bean-AWWARF)
W73-11314

WATER SUPPLY IMPROVEMENTS FEATURE NEW COAGULATOR,
Crew (Alfred), Ridgewood, N.J.
A. Crew.
Public Works, Vol 93, No 12, p 68-71, December 1962. 1 fig.

Descriptors: *Water treatment, Sedimentation, *Filtration, Phosphates, Design, *New Jersey, *Coagulation, Settling basins.
Identifiers: *Permujet unit, Haledon (N.J.).

At Haledon, N.J. the water supply reservoir averages only 8 ft. in depth with storage estimated at 185 mg when full, and safe yield at 0.88 mgd. It serves 2,500 consumers, an average of 1.13 mgd. (This includes some water purchased from the Passaic Valley Water Commission.) Treatment units consisted of two sedimentation basins each with a capacity of 900,000 gallons, five rapid sand filters using Anthrafilt media with carborundum plate underdrains, a 170,000 gal. clear well, and chemical feeders for carbon, alum, soda ash, Calgon and chlorine. Included in new facilities designed in 1960 was a new coagulation-sedimentation unit 43 ft in diameter, and 12 ft deep. The reinforced concrete tank houses a Permujet unit furnished by the Permutit Co., designed for a maximum rate of 1400 gpm, minimum detention time 90 minutes. This is the first municipal installation of the unit in the U.S. though it has operated on process water in a paper mill in New England. Several municipal installations have been made in the Union of South Africa. The raw water and coagulating chemicals are mixed in the influent line of the Permujet unit and enter at the center of the tank floor beneath the conical rotor float. Clarified effluent is collected by a peripheral weir. (Bean-AWWARF)
W73-11315

OZONATION AT WHITING: 26 YEARS LATER,
Whiting Water Works, Ind.
J. F. Bartuska.
Public Works, Vol 98, No 8, p 112-114, August 1967. 1 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Ozone, Activated carbon, Chlorination, Taste, Odor, *Indiana, *Water pollution treatment.
Identifiers: Whiting (Ind).

Whiting's source of water supply, lower Lake Michigan, became so polluted that the city found it necessary to build a purification plant in 1920. Pollution increased in the thirties so that the activated carbon required was not economically feasible, and did not produce an acceptable improvement in taste and odor. Because phenols were present in the water, chlorine produced a chlorophenol taste. The City installed an ozonation plant of 50 lbs/day capacity, later increased to 75 lbs/day, which is still in operation (26 years later). Nearly 40 percent reduction in other chemicals resulted and water with higher initial threshold odors is being reduced to levels lower than possible before the ozonation treatment was adopted. (Bean-AWWARF)
W73-11316

A WATER SYSTEM DESIGNED TO ATTRACT INDUSTRY,
Oregon Water Dept., Ohio.
E. D. L. York, and S. J. Wittenberg.
Public Works, Vol 95, No 5, p 118-119, May 1964.

Descriptors: *Water treatment, *Sanitary engineering, *Water supply, Industrial plants, *Public benefits, Storage, Economics, Design, *Ohio.
Identifiers: Distribution systems, Oregon (Ohio).

Oregon, Ohio, decided that its future was dependent upon its ability to attract new industries and to help those already established there by offering a sufficient water supply. Water was then purchased from the City of Toledo. Residents voted a one percent payroll tax and earmarked the funds for a water plant. Funds also were provided under the Federal Public Works Acceleration Act of Sept. 14, 1962. An 8 mgd plant was built, with a 48-in intake line from Lake Erie, and a 1 mgd elevated storage tank. The system was extended to provide service to a larger area. Excess water was offered to two neighboring communities. Four major oil companies are now operating refineries in Oregon, two new major industries are virtually

assured of locating in the area and four new housing subedivisions are under construction. (Bean-AWWARF)
W73-11317

TASTE AND ODOR CONTROL IN WATER,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
E. J. Middlebrooks.
Public Works, Vol 96, No 4, p 127-130, April 1965. 1 fig, 2 tab, 8 ref.

Descriptors: *Water treatment, *Water quality, *Sanitary engineering, Chlorination, Ozone, Chlorine dioxide, Activated carbon, *Taste, *Odor.

Causes of tastes and odors are discussed. Algae, decaying vegetation, and industrial wastes are the usual causes. Measurement of odors by the threshold odor test, together with carbon adsorption and extractions by chloroform and alcohol are described. Preventive treatments by use of copper sulfate and chlorine are discussed and a table shows concentrations required for different algae. The roles that ozone, chlorine dioxide and activated carbon can play in destruction or removal of odors are also discussed. (Bean-AWWARF)
W73-11318

ACTIVATED CARBON FOR WATER TREATMENT,
West Virginia Pulp and Paper Co., Tyrone, Pa. Chemical Div.
A. Y. Hyndshaw.
Taste and Odor Control Journal, Vol 32, No 1, p 1-7, January 1966. 6 fig, 2 tab.

Descriptors: *Water treatment, *Activated carbon, *Chlorine, Water quality, *Coagulation, *Organic compounds, Taste, Odor.

The action of chlorine is one of oxidation or 'burning up' of unwanted substances in water. Because carbon can adsorb chlorine, the two substances should rarely be applied in close proximity - rather, depending upon the circumstances, one or the other should be applied and time allotted to obtain maximum benefits before adding the other. Figures illustrate contrasting results with different waters. In some, chlorine should be applied first, while in others the carbon should be first. This indicates that some materials are more readily adsorbed by chlorine before they are chlorinated, others are more readily adsorbed after they are chlorinated. Chlorine demand may sometimes be reduced by preceding carbon application. Activated carbon application in the coagulation process will remove many organic compounds, thereby reducing tastes and odors. (Bean-AWWARF)
W73-11352

EVALUATION OF NEW ALGICIDES FOR WATER SUPPLY PURPOSES,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
C. M. Palmer.
Taste and Odor Control Journal, Vol 23, No 1, p 1-4, January 1957. 10 ref.

Descriptors: *Water treatment, *Algae, *Algicides, *Antibiotics, Zinc, Copper sulfate, Chlorine.
Identifiers: Activated silver, Chlorine dioxide, Quinones, Quartenary ammonium compounds, Rosin amines.

For control of algae in water intended for domestic and industrial uses, only two basic chemicals-copper sulfate and chlorine-are commonly recommended, in great contrast to the rapidly increasing number of chemicals being made available for control of pests in commodities other than water. Research indicates promising possibilities with compounds containing quaternary ammonium compounds, rosin amines, quinones, activated silver, urea compounds, chlorophenates, antibiotics, organic zinc, copper and chlorine compounds such as copper citrate and cupric-chloramine, and chlorine-dioxide. The new compounds will be more expensive than those presently in use and will therefore be used under careful control. They will probably be selective as to the type of algae affected. There are, as yet, no completely new algicides which appear to be safe for use in public water supplies. (Bean-AWWARF)
W73-11353

REVERSE OSMOSIS WATER PURIFYING SYSTEM WITH GRADIENT BARRIER WATER STORAGE CONTAINER,
Desalination Systems, Inc., Escondido, Calif. (assignee)
For primary bibliographic entry see Field 03A.
W73-11356

HELICOPTER APPLICATION OF COPPER SULFATE,
East Bay Water Co., Oakland, Calif.
D. G. Rosenberg.
Taste and Odor Control Journal, Vol 30, No 8, p 1-6, Aug. 1964. 1 tab.

Descriptors: *Water treatment, *Algae, *Copper sulfate, Microorganisms, Taste, Odor, Economics.
Identifiers: *Helicopter application.

Treatment of the San Pablo Reservoir, for control of algae, generally required three or more applications of copper sulfate each year, when applied by boat. Helicopter treatment proved more effective, requiring only two treatments. This saves $1,200. in material cost which pays for the two helicopter flights required. Applications equal 10 to 14 lbs/acre. The criteria for grind of copper sulfate were, (1) it must be compatible with the feeding equipment, (2) dissolve in the top 10 ft of the water, (3) create a minimum drift problem, and, (4) be commercially available at an economical price. (Bean-AWWARF)
W73-11419

HOW TO BLACK OUT ALGAE,
Wilmington Board of Water Commissioners, Del.
M. S. Shane.
Taste and Odor Control Journal, Vol 29, No 9, p 1-4, Sept, 1963. 1 tab.

Descriptors: *Water treatment, *Algae, *Crustaceans, *Activated carbon, Microorganisms, Fish, Taste, Odor, Copper sulfate, Chlorine.
Identifiers: Alum, Backwashing, Blackout, Filter runs.

Growth of algae in an open 35 mg pre-settling reservoir caused taste and odor and very short filter runs. Copper sulfate treatment was practiced twice a week in spring and summer but growths of moss and microorganisms (algae and crustacea) occurred. Fish population was reduced to near extinction. Filter runs were only 7 to 10 hours. A dosage of 2 to 3 ppm activated carbon reduced algae growths, corrected the taste and odor problems, allowed increased fish propagation, and lengthened the filter runs to around 35 hours. The 2 ppm application appeared by observation to allow a penetration of sunlight of only 1.5 to 2 feet. The reduction in algae count due to the 'blackout' resulted in lower dosages of alum, chlorine and copper sulfate. Washwater use was reduced. As a result of the improvement in operations and quality it was decided to continue the carbon treatment throughout the entire year. (Bean-AWWARF)
W73-11420

TASTE AND ODOR CONTROL - CHEMICALS AND METHODS.
West Virginia Pulp and Paper Co., Tyrone, Pa. Technical Service Lab. Staff.

Descriptors: *Water treatment, *Algae, *Taste, *Odor, Ammonia, Copper sulfate, Activated carbon, Chlorine, Ozone, Oxidation, *Aeration.
Identifiers: Aeration, Chlorine dioxide, Permanganate, Chemical treatment.

Methods for controlling tastes and odors include (a) prevention of taste formation by application of ammonia, copper sulfate, and activated carbon, (b) oxidation of taste and odor compounds by chlorine, ozone, chlorine dioxide, and potassium permanganate, and (c) adsorption of taste and odor bodies on activated carbon. Ammonia applied before chlorine will prevent formation of malodorous chlorine compounds. Copper sulfate reduced growth of algae which cause odors. Activated carbon will cause 'blackout' excluding light thereby reducing algae growths. Aeration removes volatile compounds such as hydrogen sulfide and increases the dissolved oxygen content. Chlorination in the free chlorine range will destroy many substances which otherwise may cause taste and odor. Ozone, one of the strongest oxidants available is used extensively in Europe for disinfection. Chlorine dioxide, generated in the water plant by reaction of sodium chlorite with chlorine has much greater oxidizing power than chlorine. It is effective for destruction of phenolictype odors. Potassium permanganate can oxidize some troublesome organics to less odorous compounds. The method most widely used in adsorption on activated carbon and measurement of tastes and odors, particularly the threshold odor test. (Bean-AWWARF)
W73-11421

ACTIVATED CARBON FOR PALATABLE WATER: GRANULAR OR POWDERED.
Westvaco Corp., Covington, Va. Chemical Div.

Taste and Odor Control Journal, Vol 35, No 3, p 1-10, March 1969. 6 fig.

Descriptors: *Water treatment, *Organic compounds, *Activated carbon, *Chlorine, Tasts, Odor, Potable water.
Identifiers: *Granular carbon filters.

Compared to other water treatment practices, granular carbon filtration is relatively new. While current technology has provided an economical and effective method for treating water, there still remain a number of unknown quantities that must be studied. These include reaction depths of beds, biological growths in granular carbon beds, quality of granular carbon after repeated regeneration, adverse effect of high turbidity upon sorptivity, and breakthrough of odors, all of which are discussed. The data now indicate that with the possible exception of plants which superchlorinate, powdered carbon will normally be more economical than granular carbon for plants feeding low dosages of powdered carbon. For plants feeding high dosages, it appears that granular carbon will be more economical. The powdered carbon dosage at which granular becomes more economical depends upon a number of factors, which are discussed. Pilot studies at dosages below 2 ppm are impractical. (Bean-AWWARF)
W73-11422

TWO-POINT COPPER SULFATING PROGRAM LICKS/ALGAE PROBLEM,
Richmond Dept. of Public Utilities, Va.
W. W. Anders.
Water Works Engineering, Vol 114, No 8, p 700-701, 729, 732, August 1961. 2 tab.

Descriptors: *Water treatment, Sanitary engineering, *Algal control, Algicides, *Copper sulfate, Taste, Odor, *Water distribution (Applied), Distribution systems.

Identifiers: Richmond (Virginia).

By practicing chemical control in the raw water in its James River settling basins, and augmenting this procudure with application to the filtered water ahead of aeration Richmond, Virginia has licked its taste and odor problems, carried algicide thorughout its distribution system, and kept its mains and meters clean. The algae vary, and dosages vary, with the seasons throughout the year. Each week the settling basins are treated with copper sulfate; 600 lbs. in summer and 200 lbs. in winter. Treatment of filtered water is continuous to maintain a residual of copper entering the distribution system equal to 0.15 to 0.20 ppm in the warmer months, and 0.10 to 0.15 ppm in winter. This is sufficient to retard algal proagation in the open reservoir, elevated storage tank and distribution system mains. There is no evidence of copper build-up in the distribution system. The reduction of bad water complaints and the freedom from stopped and clogged meters provide a handsome return on the small cost of this copper treatment. (Bean-AWWARF)
W73-11447

FILTER WASHING GOES MODERN,
Fischer and Porter Co., Warminster, Pa.
M. W. Herman.
Water Works Engineering, Vol 113, No 10, p 894-899, 925, October 1960. 6 fig.

Descriptors: *Water treatment, Sanitary engineering, Filtration, *Design, *Automation, Cleaning, Treatment facilities.
Identifiers: *Backwashing.

Washing filters is a task that consumes a great many hours annually. Automatic washing can take the drudgery out of the time-consuming operation. Systems are available with warning features which apprise the operator of any malfunction. They are available to operate and return the filter to service upon completion of the wash, the entire process is started by a push button. Other systems will bring the washing cycle to a halt in the vent of a component failure, and resume operation only when the failure has been corrected. Filter plants, like most process plants, are individuals, each with its own requirements, limitations and peculiarities. What works well for one may not be required or even desirable for another. Hence, a filter washing system must be designed around a given plant, or around a set of plans from which the plant is to be built. Plant size, water characteristics, piping layouts, operator coverage and other factors must be considered. (Bean-AWWARF)
W73-11448

ZETA POTENTIAL CONTROL IMPROVES COAGULATION OF COLLOIDAL WATER.

Water Works Engineering, Vol 113, No 8, p 712-716, August 1960. 9 fig.

Descriptors: *Water treatment, Sanitary engineering, *Zeta potential, *Colloids, Settling velocity, *Filtration, *Electrolytes, Chlorination, New York, Treatment facilities.
Identifiers: Activated silica, Waterford (New York).

The Waterford, New York, treatment plant handles polluted raw water from the Hudson River and delivers high quality water at a rated capacity of 2 mgd. It is the first plant specifically designed and operated on the basis of continuous control of zeta potential. Wastes of pulp and paper mills, and textile industries, prevented the old plant from delivering water of satisfactory taste and odor and at more than half its rated capacity. The new plant has better chemical feed facilities, more effective treatment and control devices and zeta potential control of coagulants and polyelectrolyte coagulant aids. The object of controlling the zeta potential and improving the molecular structure is to produce an alum or ferric floc which will adsorb, enmesh and remove farm more organic colloids than is possible with standard practice these, colloids were responsible for tastes and odors in the finished waters. The major cause of suspension of colloids is the electrical charge on the surface of particles. Zeta potential measurements indicate these charges. When they have neutralized, destabilization occurs, aiding flocculation. Treatment includes chlorination, acitvated carbon, aeration, alum with zeta potential control, activated silica, catonic polyelectrolyte and anionic polyelectrolyte, settling, filtration and secondary chlorination. (Bean-AWWARF)
W73-11449

MICROSTRAINING REMOVES ALGAE AND CUTS FILTER BACK-WASHING,
Water Works Engineering, Vol 113, No 4, p 554-555, April 1960.
J. Scriven.

Descriptors: *Water treatment, *Filtration, *Algae, Costs, Plankton, Cleaning, Treatment facilities, Canada.
Identifiers: *Microstraining, Backwashing, Belleville (Canada).

Following successful pilot plant tests, four microstraining units were installed at Belleville to overcome short filter runs caused by heavy loads of plankton during the summer months. High backwash requirements were coupled with heavy and uneconomical consumption of coagulants, causing increased operating costs while rising demands on the supply became more diffi ult to meet. The new units reduced backwashes to less than one-quarter in number, and the volume of water used for backwash of filters and for strainers to a little over one-half the amount previously used for backwashing. (Bean-AWWARF)
W73-11450

DESIGN FACTORS FOR EFFECTIVE SETTLING OF COAGULATED WATER,
Massachusetts Inst. of Tech., Cambridge.
R. Eliassen, and E. A. Cassell.
Water Works Engineering, Vol 110, No 11, p 1105-1107, November 1957. 4 fig.

Descriptors: *Water treatment, *Design, *Settling velocity, Coagulation, *Filtration, Sludge, Weirs, Overflow, Cleaning, Treatment facilities.
Identifiers: *Backwashing.

Efficient operation of rapid sand filters, to provide long runs and low backwash water consumption, depends upon the removal of greater than 95 percent of the floc particles in the settling tank. To accomplish this, the design engineer must consider all design factors which influence good operation of settling tanks. Vertical settling velocity of floc is most important-good coagulation should produce floc with settling velocity exceeding 2 ft. per hour. Dense calcium carbonate floc may settle at 10 ft. per hour. Horizontal flow through the tank must be low enough to avoid scouring of settled sludge. The settling velocity of the floc and the horizontal water flow must allow the floc to reach the tank bottom before reaching the effluent end and it must remain there as sludge, until removed. Weir design is especially important with light alum floc; the vertical velocities must be kept as low as possible. Good practice limits the weir overflow rate to 30,000 gpd per ft of weir length. Weir plates are frequently a series of small V-notches about 2 in deep and spaced from 6 to 12 inches on center, to assure more uniform flow over the weirs. (Bean-AWWARF)
W73-11451

PROGRESS REPORT ON WATER QUALITY OF LAKE MICHIGAN NEAR CHICAGO,
Chicago Dept. of Water and Sewers, Ill.
For primary bibliographic entry see Field 05B.
W73-11581

SOFTENING A 46-GRAIN WATER,
Elmore Water Works, Ohio.
N. Damschroder, and R. Murphy.
Water Works Engineering, Vol 115, No 10, p 818-819 and 853, October 1962. 2 fig, 1 tab.

Descriptors: *Water treatment, *Water softening, Hardness (Water), *Zeolites, Iron, Aeration, Chlorination, Phosphates, Hydrogen ion concentration, Filtration.
Identifiers: Softening capacity, Salt efficiency.

Well water of 46-grains hardness is reduced to 8 ppm hardness by zeolite filters, salt regenerated. Iron content is reduced from 0.5 to less than 0.1 ppm. Some hard water is by-passed so that water being distributed has a hardness of 5 grains per gallon, and iron content is always below 0.1 ppm. The well water is aerated on slat tray aerators to remove carbon dioxide before it passes to the zeolite filters. The salt used in regeneration averages 0.33 pounds per 1,000 grains hardness removed. In seven years of operation loss of zeolite has been very slight, equivalent to only 0.75 percent per annum. The zeolite has exactly the same softening capacity and salt efficiency and very nearly the same grain size, uniformity and moisture content now as when installed nearly seven years ago. Since installation of this softening plant no funds have been spent for parts or equipment. Chlorine is introduced after aeration and just prior to softening but the water softness has not been affected in any way. Effluent of the softening plant is treated with 5 ppm chemical phosphate which raises the pH to 7.8 and makes the water quite stable and completely passive to the piping system. (Bean-AWWARF)
W73-11665

IMPROVED WATER AT LOWER COST PRODUCED WITH COAGULANT AID,
Bloomington Waterworks, Ind.
I. L. Dickstein.
Water Works Engineering, Vol 115, No 4, p 266-268 and 292-293, April 1962. 2 tab.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, Design, Turbidity, *Electrolytes, Head loss, Costs, Cleaning.
Identifiers: Alum, Backwashing, Coagulant aid, Bloomington (Indiana).

Coagulant aid in the Bloomington, Indiana water treatment plants has produced a major cost-saving through reduction in alum dosage required; a 100 percent increase in length of filter runs; and ability to handle the peak loads presently being placed upon the plants. The reduction in alum cost exceeds the cost of the coagulant aid. During the summer months there does not seem to be any remarkable decrease in turbidity of settled water but the character of the solids passing onto filters is more porous, causes less clogging and requires less backwash water. For the first time water in the clear well lost all evidence of haziness after start of coagulant aid dosage, with Mogul Claracel. The material is a liquid and is fed by a simple gravity drip-feed arrangement. In an old plant the feed is added in the flocculation section of the mixers. In a new plant, it is applied to the inner cone of the clarifier near the mixing paddle. (Bean-AWWARF)
W73-11666

60-MGD MICROSTRAINING PLANT MEETS DENVER'S GROWING NEEDS,
Denver Board of Water Commissioners, Colo.
G. J. Turre.
Water Works Engineering, Vol 114, No 12, p 1054-1056 and 1081, December 1961. 3 fig, 1 tab.

Descriptors: *Water treatment, *Filtration, *Algae, *Turbidity, Treatment facilities, Costs, Design, Colorado.

dentifiers: *Microstraining, Denver (Colorado).

To meet spiraling water demands, Denver, Colorado, built a 60 mgd microstraining plant. It costs considerably less than a rapid sand filter installation; space requirements are much less; and operating costs will be lower, particularly since the staff of the adjacent existing filter plant will be able to operate the new facility. It consists of 12 units each 10 ft in diameter and 10 ft long. The water is low in basic turbidity, but subject to high algal infestation. The algae are removed by the microstrainers. Turbidity produced is not as low as that produced by the standard plant but is well within the limit of the U.S. Public Health Drink Water Standards. A table indicates the average turbidity of the strained water over 24 months is 1.2, reduced from 3.5 in the raw water. (Bean-AW-WARF)
W73-11667

SYSTEMS APPROACH TO TRAINING AND LICENSING OF WATER WORKS PERSONNEL IN ONTARIO,
Ontario Water Resources Commission, Toronto.
A. B. Redekopp, and J. H. Austin.
Ontario Water Resources Commission, Toronto, Ontario, Canada, circa 1972. 17p, 3 fig.

Descriptors: *Water works, *Personnel, *Training, Personnel management, Engineering education, Water treatment, Permits, Systems analysis, Canada.
Identifiers: *Toronto (Ontario).

Past methods of training water works personnel by the seat of the pants' is no longer satisfactory in today's advanced water treatment plants. A scientific system, or systems approach, must be taken to provide organized training in both theory and 'hands-on' equipment training. Along with training should be a licensing program. Such a training and licensing program will increase the usefullness of the personnel, result in a more professional staff, and provide assurance to the public that the staff is qualified. The program should cover all aspects of plant operation and should allow the men to proceed at the pace and level that they are able to maintain. Training should maximize the use of modern media to approximate reality as closely as possible and the staff of the training center should be experts in their subject areas. (Poertner)
W73-11676

OZONE FOR SUPPLEMENTARY WATER TREATMENT,
Metropolitan Corp. of Greater Winnipeg (Manitoba). Water Works and Waste Disposal Div.
R. C. Sommerville, and G. Rempel.
Preprint of a paper presented at the American Water Works Association Annual Meeting, Denver, Colorado, June 15, 1971. 19 p, 3 fig, 2 tab, 3 ref.

Descriptors: *Ozone, *Water treatment, *Feasibility studies, Water supply, Municipal water, Water works, Water resources development, Cost analysis, Disinfection, Pretreatment (Water), Filtration, Canada.
Identifiers: *Winnipeg (Manitoba), *Supplementary treatment.

Several types of treatment were studied for supplying pure water to Winnipeg in future years. Ozonation, as used in France, Scotland and Ireland, was found to be up to 75 percent cheaper to operate than conventional treatment because power is relatively cheap (0.7 cents/kwh). A two-year testing program of ozonation along with microstraining, alum treatment, and filtering was undertaken. Ozone is injected into the water after microstraining and sent to a contact tower for a retention period of about 5 minutes. The water is then filtered or, in some instances, alum is added before filtration. The ozone dosage depends upon a number of factors including: (1) oxidizable matter in the water, (2) efficiency of emulsification, (3) water temperature, (4) Ozone concentration, (5) contact time and (6) residual required. Dosages of from 2 to 5 mg/l of Ozone were usually used with residuals of at least 0.1 mg/l. Although color removal was excellent, algae removal depended upon the type of algae and ranged from 65 to 75 percent reductions for Oscillatoria and Anabaena to only 10 percent reductions for Coelastrum. Total disinfection was not always achieved even with an Ozone residual, and the water was never disinfected if a residual was not present. (Poertner)
W73-11677

5G. Water Quality Control

EVALUATION OF POLLUTION ABATEMENT PROCEDURES MORAINE STATE PARK,
Gwin, Dobson and Foreman, Inc., Altoona, Pa.
J. W. Foreman, and D. C. McLean.
Copy available from GPO Sup Doc as EP1.23/2:73-140, $1.00; microfiche from NTIS as PB-221 337, $0.95. Environmental Protection Agency, Technology Series EPA-R2-73-140, January 1973. 41 p, 12 fig, 7 tab, 9 ref. EPA Grant 14010 DSC.

Descriptors: *Mine drainage, *Pennsylvania, *Sealants, *Cost analysis, Acid mine water, Pollution abatement.
Identifiers: *Moraine State Park (Penn), Lake Arthur, Mine sealing, Surface mines, Bulk head seals.

Various mine drainage pollution abatement techniques completed during the construction phase of the Moraine State Park, Pennsylvania, were evaluated. The remedial methods employed included strip mine reclamation, underground-mine sealing, grouting, surface sealing, refuse pile removal and oil and gas well plugging. Results of the underground mine hydraulic sealing and grouting work indicate an overall reduction in discharge flow rates from 146 to 57 gallons per minute, an overall reduction in net acidity from 501 to 160 pounds per day. The hydraulic sealing costs ranged from a low of $8,308 to a high of $58,437 per seal, for an average cost of $19,480 per seal. Before and after data for the strip mine reclamation projects indicate a minor net decrease in the average discharge flow rates from 142 to 136 gallons per minute, an overall reduction in acidity from 50 to 22 pounds per day. The strip mine reclamation costs ranged from a low of $420 to a high of $2700 per acre, for an average of $1455 per acre. (Hill-EPA)
W73-11062

THE DEVELOPMENT AND DEMONSTRATION OF AN UNDERWATER OIL HARVESTING TECHNIQUE,
JBF Scientific Corp., Burlington, Mass.
R. A. Bianchi, and G. Henry.
Copy available from GPO Sup Doc as EP1.23/2:73-205, $1.25; microfiche from NTIS as PB-221 431, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-205, April 1973. 86 p, 36 fig, 6 tab, 51 ref. EPA Project 15080 FWL, Contract 14-12-899.

Descriptors: Water pollution control, Oil pollution, *Oil spills, *Pollution abatement, *Massachusetts.
Identifiers: *Mechanical clean up, Oil spill clean up, *Oil recovery systems.

Analytical studies and harbor tests were conducted to determine the feasibility of harvesting oil beneath the surface of the water with the use of inclined planes. The analytical and laboratory investigations provided basic information to design and build units and showed that this kind of device could harvest both light and heavy oils between 3/4 knot and 2 knots. Information was obtained regarding the geometry of the device. Tests showed that oil could be collected in waves without seriously affecting efficiency. A 22-foot-long unit was designed, built, and demonstrated in Boston Harbor. The results showed that the fixed-plane concept is highly effective in areas where the vessel can travel through the slick. Recovered oil is virtually water free and the unit recovered between 70% and 85% of the oil presented to it. The fixed inclined plane (SHOC) demonstrator unit works between 3/4 knot and 2 knots. To extend the velocity range down to zero knots and over 2 knots, it is recommended that a moving inclined plane be used. It is also recommended that a set of effective sweeps be investigated and developed. (EPA)
W73-11063

DEVELOPMENT OF A MOBILE SYSTEM FOR CLEANING OIL-CONTAMINATED BEACHES,
Ecological Research Corp. Miami, Fla.
F. X. Dolan, and J. P. Bowersox.
Copy available from GPO Sup Doc as EP1.23/2:73-233, $1.25; from NTIS as PB-221 432, $3.25 in paper copy, $0.95 in microfiche. Environmental Protection Agency, Technology Series Report EPA-R2-73-233, May 1973. 92 p, 22 fig, 7 tab, 12 ref.

Descriptors: *Oil spills, *Separation techniques, Beaches, Oil-water interfaces, Oil pollution, *Pollution abatement.
Identifiers: *Sand washing, Liquid-liquid separation, *Hydrocyclones, *Oil-water separation.

A system has been developed for the restoration of oil-contaminated beach sands. The method involves washing the sand in a high energy jet contactor washer and separation of the cleaned sand from the washing fluid in a conventional solid-liquid cyclone. Separation and concentration of the oil-water effluent from the washing process is also accomplished in cyclones. The two separate stages of this process have been demonstrated on a pilot scale equivalent to about 3 tons of wet, oil contaminated sand per hour. The sand washing process has been shown capable of removing over 99% of the contaminating oil from a simulated beach sand. Oils used were No. 4 and No. 6 fuel oil at 4 to 8% of the dry weight of the sand. The oil-water separation tests yielded a highly enriched oil product stream with less than 20% water, while the water removed from the system was suitable for recycle to the sand washing system. A conceptual design for a mobile beach cleaning system based on the processes studied is presented and is shown to be feasible within the state-of-the-art. (EPA)
W73-11064

OXIDATION OF PYRITES IN CHLORINATED SOLVENTS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 05D.
W73-11068

DEVELOPMENT AND PRELIMINARY DESIGN OF A SORBENT-OIL RECOVERY SYSTEM,
Hydronautics, Inc., Laurel, Md.
E. Miller, L. Stephens, and J. Ricklis.
Copy available from GPO Sup Doc as EP1.23/2:73-156 $2.60; microfiche from NTIS as PB-221 497, $0.95. Environmental Protection Agency Technology Series Report, EPA-R2-73-156, January 1973. 191p, 69 fig, 36 tab, 2 ref. EPA Project 15080-HEV.

Descriptors: *Oil spills, Water pollution treatment, *Design criteria, *Laboratory tests, *Secondary recovery (Oil), Pollution abatement, Water pollution control Conveyance structures.
Identifiers: *Sorbent-oil recovery system, Sorbents.

A development program was completed and preliminary designs were prepared for 3000 gallon/hour protected water and 10,000 gallon/hour unprotected water Sorbent Oil Recovery Systems. The five phases in the development program were: (1) characterization of the sorbent material, (2) the development of the sorbent broadcasting system, (3) the development of the harvesting conveyor and evaluation of overall recovery performance, (4) the development of the sorbent regeneration system and (5) model tests of a 1/4-scale model recovery platform. The development program showed that a continous sorbent-oil recovery system is feasible using 30 or 80 PPI polyurethane sorbent chips. In one pass about 90 percent of the oil in a 1.5 mm slick can be recovered. The water content of the Recovered Fluid is less than 10 percent. The preliminary designs are presented with detailed descriptions of the system components, operating procedures, and costs. (EPA)
W73-11071

ANALYSIS OF ENGINEERING ALTERNATIVES FOR ENVIRONMENTAL PROTECTION FROM THERMAL DISCHARGES.
Washington State Water Research Center, Pullman.

Copy available from GPO Sup Doc as EP1.23/2;73-161, $2.60; microfiche from NTIS as PB-221 498, $0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-73-161, March 1973. 228 p, 15 fig, 17 tab. EPA Project 16130 FLM.

Descriptors: *Thermal powerplants, *Thermal pollution, Mathematical Models, *Alternative planning, *Decision making, Sites, Intakes, *Environmental control, Chemical wastes, Water temperature, Cooling water, Water pollution effects, Environmental effects.

A decision tree framework was utilized to intergrate engineering decisions concerned with the control of environmental impacts from stationary thermal power plants. The engineering costs and the ecological response of fish communities to any sequence of decisions in the tree can be computed with the models developed in this study. A series of formulations were also developed to describe the environmental impact of siting a series of power plants in a region. Both the static and dynamic models require verification before they are applied. Impacts of thermal and chemical discharges to the receiving waters and mechanical damage from screening devices are modeled. (EPA)
W73-11078

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM,
Northern Maine Regional Planning Commission, Presque Isle.
For primary bibliographic entry see Field 05D.
W73-11079

PROGRESSIVE TAXATION AS A POLICY FOR WATER QUALITY MANAGEMENT,
California Univ., Riverside. Dept. of Economics.
T. A. Ferrar.
Water Resources Research, Vol 9, No 3, p 563-568, June 1973. 3 fig, 5 ref.

Descriptors: *Water resources, *Water quality, *Management, *Pollution taxes (Charges), *Water quality standards, Effluents, Pricing, Waste disposal, Resource allocation, Mathematical models, Systems analysis, Optimization.
Identifiers: *Cost minimization.

Recent literature on environmental control and water resources management has advocated the allocative efficiency associated with standard effluent taxation control measures. This article demonstrates that the operational characteristics of such techniques tend to render them impotent as standard maintenance measures: The significant operational weakness is a fundamentally static applicability. Since most acute environmental problems occur in vigorously developing metropolitan areas, the concept of a linear, static equilibrium charge is meaningless in such dynamic settings. A new, nonlinear effluent taxation structure is proposed that alleviates this weakness by incorporating a progressive taxation schedule that is tied to water quality standards. An allocation model is outlined, and the rationing procedure involves an incentive-feedback algorithm that iteratively allocates the available environmental resource among the polluters in accordance with a cost minimization objective. (Bell-Cornell)
W73-11147

COST-EFFECTIVENESS METHODOLOGIES FOR DATA ACQUISITION IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, and D. H. Vanderholm.
Water Resources Research, Vol 9, No 3, p 536-545, June 1973. 3 fig, 4 tab, 10 ref.

Descriptors: *Water quality, *Management, *Methodology, *Data collections, *Evaluation, *Costs, *Colorado, Design, Model studies, Streams, Simulation analysis, Systems analysis, Mathematical models.
Identifiers: *Grab-sampling, *Cost-effectiveness, *Data acquisition.

Current water quality management procedures are established in such a manner that they require sound data for effective action. In establishing the regulatory procedures, much emphasis has been placed on the water criteria, whereas little emphasis has been given to developing ways and means to provide meaningful data to enforce the criteria. This study develops methodologies that permit the rational evaluation and design of data acquisition system alternatives for water quality management. This necessarily includes an evaluation of the cost of a data acquisition system and its effectiveness. The evaluation and design procedure of the water quality data acquisition system is based on two major points. First, the strategy used by the managing agency must be related to a specific type or form of data. Second, the character of the streams to be managed must be carefully delineated. To relate these two points to some measure of system effectiveness, a data acquisition model is developed which relates grab-sampling frequency to the detection of pollution events. By then determining the cost of various sampling frequencies, cost-effectiveness relationships can be developed. The procedure is applied to the State of Colorado. (Bell-Cornell)
W73-11150

AN ENVIRONMENTAL EVALUATION SYSTEM FOR WATER RESOURCE PLANNING,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 06A.
W73-11151

ENVIRONMENTAL CONSERVATION,
For primary bibliographic entry see Field 06G.
W73-11170

ENVIRONMENTAL HAZARDS IN THE CONTROL OF DISEASE VECTORS,
Florida State Div. of Health, Vero Beach. Entomology Research Center.
For primary bibliographic entry see Field 05C.
W73-11182

ENVIRONMENT,
Colorado School of Mines, Golden. Research Inst.
For primary bibliographic entry see Field 05C.
W73-11183

MINERAL INDUSTRY VS. ECOLOGY.

Mining Engineering, Vol 23, No 8, p 51-60, August 1971. 6 fig, 7 tab, 28 ref.

Descriptors: *Mineral industry, *Environmental effects, Air pollution, Solid wastes, Water pollution, Ecology, Mining, Mine waters, Safety, Hazards, Human pathology, Ventilation, Molybdenum, Heavy metals, Metals, Waste water treatment, Oil.
Identifiers: Silicosis, Pneumoconiosis.

All aspects of human environment effectively connected with the mineral industry are discussed. Pneumoconiosis as a result of coal mining is under control in a modern mine, however it is still a threat as is the case with silicosis in metal mines. Instrumentation protecting people from these hazards is described. Basic ways in which surface mining disturbs the land are spoil banks, high walls, toxic soil and waste disposal. Results of recent Kennecott tailings stabilization tests are presented. Water pollution problems are in urgent need for attention particularly in metal industries. Magnetic agglomeration seems to be a promising method for classification and separation of metallics in solid wastes, as well as in treatment of steel industry waste waters. Air pollution control measures are also presented. (Oleszkiewicz - Vanderbilt)
W73-11185

A STUDY OF THE FLINT RIVER, MICHIGAN, AS IT RELATES TO LOW-FLOW AUGMENTATION,
Geological Survey, Lansing, Mich.
G. C. Hulbert.
Open-file report, February 1972. 24 p, 7 fig, 3 tab, 5 ref.

Descriptors: *Low-flow augmentation, *Low flow, *Streamflow, *Michigan, Data collections, Water quality control, Conjunctive use, Discharge (Water).
Identifiers: *Flint River (Mich).

Streamflow characteristics of the Flint River and its tributaries are described, and draft-storage relations are given for the river basin. At 17 sites, the 7-day, 2-year low flow ranges from 0 to 0.17 cfs per square mile. Existing storage, if fully utilized, could provide a minimum discharge at Montrose of 160 cfs in 19 of 20 years. Low flows, in conjunction with water diverted from Lake Huron to the Flint River through the Detroit and Flint water systems (about 60 cfs in 1971), would seldom be less than about 200 cfs at Montrose. Diversions from the basin for irrigation may reduce low flows by about 12 cfs. Groundwater sources offer small potential for streamflow augmentation. (Knapp-USGS)
W73-11207

INDUSTRIAL WASTE SURVEY, DADE COUNTY, FLORIDA.
Federal Water Quality Administration, Fort Lauderdale, Fla. Lower Florida Esturary Study.
For primary bibliographic entry see Field 05B.
W73-11217

METHOD OF REMOVING OIL FROM WATER,
Basf-Wyandotte Chemical Corp., Mich. (assignee)
J. V. Otrhalek.
U. S. Patent No. 3,729,411, 3 p, 3 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1354, April 24, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Separation techniques, Water pollution control, Water quality control, *Pollution abatement, *Absorption.
Identifiers: Agglomeration, *Volcanic ash.

Silicone treated expanded volcanic ash is cast directly on to the oil film and around it. It absorbs oil forming agglomerates which can be picked up with relative ease. The ash is prepared by spraying expanded ash with a silicone emulsion, consisting essentially of 20 parts by weight of water per weight of emulsion, at a temperature ranging from 300-1500F and in an amount ranging from 25 to 400 cc of emulsion per cubic foot of ash. (Sinha-OEIS)
W73-11225

DE-OILING OF POLLUTED WATERS,
Agence Nationale de Valorisation de la Recherche, Courvevoie (France). (assignee)
For primary bibliographic entry see Field 05D.
W73-11226

WATER PURIFICATION WITH POROUS ABRASIVES,
Norton Co., Troy, N.Y. (assignee)
For primary bibliographic entry see Field 05D.
W73-11228

VACUUM SKIMMING APPARATUS FOR REMOVING LIQUID CONTAMINANTS FLOATING IN CONFINED BODIES OF WATER,
D. M. Horne, W. H. Heyser, and H. M. Neely.
U. S. Patent No. 3,727,766, 5 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 937, April 17, 1973.

Descriptors: *Patents, *Skimming, *Oil spills, *Oil pollution, Equipment, Barges, Water quality control, Harbors, Bays, Water pollution control, *Pollution abatement.

The apparatus includes a boat or barge containing at least a vacuum tank and a holding tank. The vacuum tank is vacuumized to 15 to 20 inches Hg by one or more water jet eductors which are operated by a high pressure pump drawing clean water from beneath the boat. One or more sets of vacuum hoses and suction heads are connected to the vacuum tank. The boat operators manipulate the hoses to skim the surface. The use of eductors is considered a safety device. Any overflow condition of the vacuum tank will be discharged directly through the eductors into the overboard discharge without flooding its pump and causing a loss of prime. This should afford the safe disposition of any volatile gases from petroleum type contaminants that may exist in the vacuum or holding tanks. (Sinha-OEIS)
W73-11232

SKIMMING DEVICE FOR USE ON A LIQUID SURFACE,
Gulf Oil Corp., Pittsburgh, Pa. (assignee)
For primary bibliographic entry see Field 05D.
W73-11233

WASTE WATER SAMPLER,
Tri-Aid Sciences, Inc., Rochester, N.Y. (assignee).
For primary bibliographic entry see Field 05A.
W73-11243

ENVIRONMENTAL HEALTH PLANNING.
Bureau of Community Environmental Management, Rockville, Md.

Available from the National Technical Information Service as PB-213 375. Community Environmental Management Series. 1971. 139 p, 180 ref.

Descriptors: *Environmental sanitation, *Public Health, *Planning, *Programs, Air pollution, Water quality, Solid wastes, Radiation, Noise, Vectors, Pesticides.
Identifiers: Environmental Health, Public Health Service, Bureau of Solid Waste Management (BSWM).

There is a great need for planning guidelines to help state and local administrators formulate environmental health programs. This report is partly the result of a meeting among representatives of each major environmental health program of the Public Health Service and of various professional environmental health organizations to crystalize objectives and concepts for program formulation. The emphasis of the report is on a systematic approach to the planning of each environmental health program and to the overall coordination of these programs. Program areas covered in the report include air, water, solid wastes, radiation, noise, vectors, pesticides, recreation, food, drugs, and occupational health. Within the water program the primary concern was for the protection of human health through the maintenance of high levels of water quality. This depends largely on more periodic inspection of water treatment plants, better trained operators, and expansion of overloaded facilities. (Elfers - North Carolina)
W73-11244

SCOPE OF PUBLIC WATER SUPPLY NEEDS.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 06D.
W73-11245

BROWN COUNTY SEWAGE AND SOLID WASTE STUDY - 1972.
Brown County Regional Planning Commission, Green Bay, Wis.
For primary bibliographic entry see Field 05E.
W73-11250

HOUSING AND PLANNING REFERENCES.
Department of Housing and Urban Development, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-11251

REGIONAL WASTE WATER, SOLID WASTE DISPOSAL, WATER SUPPLY, AND STORM DRAINAGE SYSTEMS APPRAISAL.
Harza Engineering Co., Chicago, Ill.

Prepared for Tri-County Regional Planning Commission: Peoria, Tazewell and Woodford Counties, Illinois, February, 1970. 91 p, 3 fig, 8 tab, 3 map, 68 ref. HUD Ill.-P-293.

Descriptors: *Planning, *Waste water disposal, Solid wastes, Water supply, Storm water, Administration, Financing, Non-structural alternatives, *Illinois.
Identifiers: Interim guidelines, *Study design, *Utility extension planning.

This comprehensive report consists of three basic parts: the formulation of interim review guidelines to be used in reviewing local applications for federal grants; the evaluation of the existing systems; and a proposed study design for further investigations and the preparation of a comprehensive plan. The review guidelines are based on the objectives that the services be adequate to protect health and safety, that planning and construction of new facilities be economically efficient, and that these facilities be compatible with the natural environment. The evaluation of the existing systems including analyses of demands, opportunities, and administration found that the improvement of the waste water and solid waste disposal systems had the highest priority. The study design emphasizes objectives, planning procedures, work schedules, budgetary requirements, and detailed outlines of what should be included in the comprehensive plans. Non-structural measures are emphasized in addition to the usual structural systems. (Elfers-North Carolina)
W73-11252

QUALITATIVE VALUES IN ENVIRONMENTAL PLANNING: A STUDY OF RESOURCE USE IN URBANIZING WATERSHEDS,
Harvard Univ., Cambridge, Mass., Dept. of Landscape Architecture.
P. Rogers, and C. Steinitz.
Available from the National Technical Information Service as AD-751 228. U.S. Army Corps of Engineers, New England Division, Waltham, Mass., October, 1969. 95 p, 24 fig, 9 tab, 15 ref, 3 append. DACW-33-DC-0151.

Descriptors: *Environmental effects, *Urbanization, *Systems analysis, Urban runoff, Aesthetics, *Simulation analysis, Computer models, Regression analysis.
Identifiers: *Charles River Basin, Environmental planning, Visual quality.

The use of systems analysis methods and models to describe the process of urbanization and to determine its effects upon the quality of the environment is presented. The report is divided into three distinct parts. Part I is a discussion of the current state of the art in urban systems analysis and model building, particularly in relation to making public investment decisions. Present models and techniques have not generally incorporated aspects of environmental quality such as aesthetics or the natural capacity of a watershed to control flood flows. Part II describes a simulation model to enable planners to quickly determine the impact of urbanization on the runoff of a watershed. The model uses such factors as land use, storm sewers, and infiltration to determine peak flows. The model is an extension of the rational method and was applied to a portion of the Charles River Basin. Part II includes detailed appendices on the computer programming procedures. Part III describes a method for evaluating the visual consequences of urbanization on shoreline landscapes. Questionnaires were used to test the importance of several visual variables related to vegetative cover, land use, color, tone, and natural quality. It was found through regression analysis that the visual quality of a landscape can be predicted by a few key variables such as vegetative opacity. (Elfers-North Carolina)
W73-11253

COMMUNITY IMPROVEMENTS AND SERVICE COSTS,
South Dakota State Univ., Brookings.
For primary bibliographic entry see Field 03D.
W73-11255

PUBLIC UTILITIES IN WINNEBAGO COUNTY.
City-County Planning Commission, Rockford, Ill.
For primary bibliographic entry see Field 03D.
W73-11263

COLORADO RIVER WATER QUALITY IMPROVEMENT PROGRAM.
Bureau of Reclamation, Washington, D.C.

February 1972, 88 p, 5 fig, 6 tab.

Descriptors: *Colorado River basin, *Water quality control, *Salinity, *Irrigation water, Mineral water, Quality control, Desalination, Weather modification, Geothermal studies.
Identifiers: *Point source control, *Diffuse source control, *Western U.S. Water Plan.

Waters of the Colorado River are becoming more saline; at the headwaters the average salinity (concentration of total dissolved solids) in the Colorado River is less than 50 mg/l and progressively increases downstream until, at Imperial Dam, the present modified condition is 865 mg/l. Projections of future salinity levels without a control program suggest that values of 1,250 mg/l or more will occur at Imperial Dam by the year 2000. One projection used in the Lower Colorado Re-

gion Comprehensive Framework Study foresees such a level being reached by 1980. Should these increases in salinity levels occur, the agriculture in the Imperial, Coachella, Gila, and Yuma Valleys would be further threatened. Also, a poorer water quality would be diverted to the Metropolitan Water District of Southern California and the Las Vegas Valley Water District, causing further economic losses to the very large block of domestic water users in California and Nevada. Upon completion of the Central Arizona Project, water users in the Phoenix and Tucson areas would be similarly affected. A comprehensive 10-year Water Quality Improvement Program has been structured and integrated with programs involving weather modification, geothermal resources, desalting, and the Western U.S. Water Plan. These programs, when implemented, could maintain salinity in the lower main stem at or below present levels. (OWRR)
W73-11264

CELL SYSTEMS KEEP MERCURY FROM ATMOSPHERE.

Chemical and Engineering News, Vol 50, No 7, p 14-15, February 14, 1972. 1 fig.

Descriptors: *Mercury, *Pollution abatement, *Air pollution, Industrial production, *Industrial wastes, Chemical wastes, Waste water treatment, Adsorption.

Two systems for reducing the amount of mercury that escapes in liquid waste streams and in vapor are compared. One, developed in the United Kingdom by BP Chemicals International incorporates a chemical scrubbing step to scavenge mercury from vent gases coming from electrolysis cells. The technique reportedly attains a removal efficiency of 95 to 99%. Monsanto in the United States has introduced a new adsorption system using canisters with a special proprietary adsorbent, which in the laboratory yielded removal efficiencies greater than 99.99%. Best operating efficiencies are achieved by teaming the adsorbent system with Brink mist eliminators, which will pretreat the gas stream with 90-99% efficiency. (Oleszkiewicz - Vanderbilt)
W73-11287

A CONTROL SYSTEM FOR MILL EFFLUENT DISPOSAL,
Bowaters Southern Paper Corp., Calhoun, Tenn.
J. K. Powell.
Tappi J Tech Assoc Pulp Pap Ind. Vol 55, No 4, p 519-523, 1972. Illus.
Identifiers: *Control system, Effluents, Flow, Velocity measurement, *Mill effluents, Rivers, Transmitter, *Pulp wastes, Waste disposal.

A method of automatically controlling the discharge of effluent from a paper mill to a river was developed. The effluent from the mill is admitted to a river through a submerged, motorized, automatically controlled gate. The effluent flow is ratioed to the actual river flow in order to discharge the optimum amount of effluent at all times. The primary problem encountered with this control system was in the measurement of river velocity and, consequently, river flow. The problem was satisfactorily solved by using a magnetic flow transmitter for river velocity measurement. A number of advantages have been realized since the conversion to automatic control: the measurement of the river flow is continuous and more accurate, an optimum ratio of effluent discharge to river discharge can be maintained at all times, and an increase in the quantity of effluent discharged has in effect increased the effluent storage reservoir capacity,--Copyright 1972, Biological Abstracts, Inc.
W73-11312

TASTE AND ODOR CONTROL IN WATER,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05F.
W73-11318

POSSIBILITY OF REDUCING NITROGEN IN DRAINAGE WATER BY ON FARM-PRACTICES, (BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA).
Bureau of Reclamation, Fresno, Calif.
For primary bibliographic entry see Field 05B.
W73-11324

AERIAL SURVEILLANCE SPILL PREVENTION SYSTEM,
McDonnell Aircraft Co., St. Louis, Mo. Reconnaissance Lab.
For primary bibliographic entry see Field 05B.
W73-11326

NUMERICAL THERMAL PLUME MODEL FOR VERTICAL OUTFALLS IN SHALLOW WATER,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
For primary bibliographic entry see Field 05B.
W73-11333

ECONOMIC FEASIBILITY OF MINIMUM INDUSTRIAL WASTE LOAD DISCHARGE REQUIREMENTS,
Datagraphics, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 05D.
W73-11335

CONTROL OF HAZARDOUS CHEMICAL SPILLS BY PHYSICAL BARRIERS,
MSA Research Corp., Evans City, Pa.
J. V. Friel, R. H. Hiltz, and M. D. Marshall.
Copy available from GPO Sup Doc as EP1.23/2:73-185, $1.25; microfiche from NTIS as PB-221 493, $0.95. Environmental Protection Agency, Technology Series Report number, EPA-R2-73-185, March 1973. 91 p, 16 fig, 14 tab, 8 ref. EPA 15090 HGP. 68-01-0100.

Descriptors: *Barriers, *Dikes, *Dams, *Water pollution treatment, *Water pollution control, Hazards, Chemicals, Accidents.
Identifiers: *Spills, *Hazardous materials, Hazardous chemicals.

The magnitude of potentially hazardous chemicals now being transported through the country poses a serious threat to the water eco-system. Unless spills can be controlled at their source, movement into the water system may be inevitable. Such control dictates the availability of systems capable of forming dikes or flow diverting barriers either as a portable system carried on the vehicle or a mobile unit rapidly deployable to the site. In this regard, a program was instituted to investigate the applicability of foamed materials for forming such dikes and barriers. It was successfully demonstrated that polyurethane could be packaged in a portable unit and dispensed as a low density rigid foam capable of diking liquids on a variety of substrates. Attempts to develop a rigid high expansion system were not fully successful. A foamed concrete system was also successfully evolved, which used mobile equipment to build free form dikes. Modified surfactant foam was also shown to be an effective cover over spilled chemicals to control vapor release and fire hazards. In each case, a field tested unit was demonstrated or shown to be feasible. (EPA)
W73-11338

LEAST COST METHOD FOR SEWER DESIGN,
Camp, Dresser and McKee, Boston, Mass.
S. Walsh, and L. C. Brown.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, Proceedings paper 9796, p 333-345, June, 1973. 4 fig, 4 tab, 5 ref.

Descriptors: *Computers, *Dynamic programming, *Sewers, *Design, *Construction costs, *Environmental engineering, Methodology, Constraints, Sanitary engineering, Optimization, Feasibility studies, Mathematical models, Systems analysis.
Identifiers: *Vertical alinement.

Engineers have achieved significant reductions in construction costs of wastewater collection systems with the use of computers. Even greater savings can be achieved by improving the method of integrating pipes into a collection system utilizing the technique of dynamic programming. A new computerized method of sewer design uses the conventional design constraints of minimum ground cover, critical invert elevations, and minimum and maximum velocities to establish a region of feasible solutions for each pipe. It treats the problem of integration of each pipe into one collection system as a sequential decision process solved by the dynamic programming algorithm. Not only is the least cost design generated, but a range of alternative discharge elevations and associated costs are made available to the engineer, allowing him maximum flexibility in exercising his judgment. Solutions of realistic sewer design problems show that the least-cost design is produced by this system. (Bell-Cornell)
W73-11360

MULTILEVEL CONTROL OF MULTIPOLLUTANT SYSTEM,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
J. W. Foley, and Y. Y. Haimes.
Journal of Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, Proceedings paper 9795, p 253-268, June, 1973. 7 fig, 3 tab, 19 ref.

Descriptors: *Water quality control, *Water pollution, *Treatment, *Effluents, *Pollution taxes (Charges), *Decision making, *Environmental engineering, Algae, Biochemical oxygen demand, Constraints, Cooling towers, Coordination, Dissolved oxygen, Optimization, Temperature, Sewage treatment, Mathematical models, Systems analysis, *Georgia.
Identifiers: *Chattahoochee River (Georgia), Decomposition.

The problem of maintaining water quality is considered. The Chattahoochee River, Georgia, is modeled in terms of BOD and temperature. The problem of determining optimal levels of treatment is iteratively solved using the multilevel approach which permits the inclusion of a Regional Authority, effluent charges, and decentralized decision making. The application of effluent charges has been extended to the case of nonlinear constraints. The coordination strategy of satisfying the Kuhn-Tucker conditions is essentially that of utilizing the economic law of supply and demand. The effluent charges are given in terms of pollution loads and hydrological characteristics. The multilevel approach allows constraints (which may be politically determined) to be explicitly incorporated into the objective function. Finally, numerical results are given for a tutorial example that illustrates the possible interactions between temperature and biochemical oxygen demand decisions and water quality constraints on maximum temperature levels, minimum dissolved oxygen levels, and maximum concentrations of algae. (Bell-Cornell)
W73-11363

ENVIRONMENTAL TERMINOLOGY INDEX.
Oak Ridge National Lab., Tenn. Environmental Information Systems Office.
For primary bibliographic entry see Field 10C.

W73-11387

PRESERVATION OF LAKE BAYKAL (OB OKHRANE OZERA BAYKAL),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 05C.
W73-11407

HELICOPTER APPLICATION OF COPPER SULFATE,
East Bay Water Co., Oakland, Calif.
For primary bibliographic entry see Field 05F.
W73-11419

THE EFFECTS OF DITCHING ON THE MOSQUITO POPULATIONS IN SOME SECTIONS OF JUNCUS SALT MARSH IN CARTERET COUNTY, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Entomology.
For primary bibliographic entry see Field 04A.
W73-11431

USING FIRE STREAMS WITH A SELF-PROPELLED OIL SPILL SKIMMER,
New York City Fire Dept.
A. C. Roberts.
Copy available from GPO Sup Doc as EP1.23/2:73-181, $0.55; microfiche from NTIS as PB-221 542, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-181, May 1973. 27 p, 6 fig, 1 ref. EPA Project 15080 FVP.

Descriptors: Oil, *Boats, Currents (Water), *Docks, Nozzles, *Oil spills, Training, *Skimming, Water pollution control, Pollution abatement.
Identifiers: Surface currents, *Fire streams, *Booming, Herding, Fire departments.

Results are reported from field tests and operations conducted by the Marine Division of the New York City Fire Department in the fall of 1972. The objective of the operations was to develop tactics for operation of a fire boat in conjunction with a self-propelled oil skimming boat for oil spill cleanup with minimum use of booms. Streams from the fireboats were used to develop currents for propelling oil toward the skimmer, to maneuver oil in conjunction with natural currents, and to concentrate oil for subsequent pickup by the skimmer. (EPA)
W73-11434

USE OF FIRE STREAMS TO CONTROL FLOATING OIL,
New York City Fire Dept.
B. Katz, and R. Cross.
Copy available from GPO Sup Doc as EP1.23/2:73-113, $0.75; microfiche from NTIS as PB-221 543, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-113, February 1973. 36 p, 6 fig, 2 ref. EPA Project 15080 FVP.

Descriptors: *Oil spoils, *Turbulence, Eddies, Hydraulics, *Jets, Piers, Velocity, Pressure, Anchors, *Boats, Currents (Water), Docks, *Nozzles, Discharge, Training, Harbors, Inland waterways, Entrainment, Momentum transfer, Emulsions.
Identifiers: Surface currents, *Monitor streams, *Hose streams, Fire departments, Booming, Herding, Rip zone, Null current zone.

The substantial momentum output of large volume, high pressure water nozzles can be used to establish surface currents which are helpful in controlling floating oil. When these induced currents have components opposite to the ambient current, a turbulent rip zone is established where the opposing currents cancel. It is mainly by means of this zone that oil slicks may be influenced in a useful way. An empirical relationship for the distance between the impact point of the stream and the rip zone, as a function of nozzle output and natural current speed, has been determined and compared with a theoretical prediction based on a simplified model. If the natural current is small, the rip zone's turbulence will be slight and it will be a barrier to approaching oil. If the natural current is large, the turbulence will be intense and the oil will be churned downward and pass under the zone. Techniques for the use of such large volume, high velocity water streams to control oil are described and their limitations are discussed. (EPA)
W73-11435

A SMALL VACUUM OIL SKIMMING SYSTEM,
New York City Fire Dept.
R. H. Cress.
Copy available from GPO Sup Doc as EP1.23/2:73-115, $0.50; microfiche from NTIS as PB-221 544, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-115, February 1973. EPA Project 15080 FVP.

Descriptors: *Oil spills, *Skimming, *Oil-water interfaces, *Entrainment, *Harbors, Water pollution control, Pollution abatement.
Identifiers: *Vacuum skimming unit, Compressed air, Floating corner skimmer, Fire department, Emergency service, Oil-water separation, Herding.

The oil-slick collection system suitable for use on harbor craft is described. This system employs a pneumatic-powered vacuum cleaner to collect oil from the water surface by entrainment in a high-velocity air stream. The components are widely available commercial items. Tests show the system to be successful in picking up No. 4 fuel and lighter oils. The collection rate depends chiefly on the rate of oil supply to the skimmer. (EPA)
W73-11436

SHORE TERMINATION FOR OIL SPILL BOOMS,
New York City Fire Dept.
A. C. Roberts.
Copy available from GPO Sup Doc as EP1.23/2:73-114, $0.50; microfiche from NTIS as PB-221 547, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-114, February 1973. 21 p, 3 fig, 1 ref. EPA Project 15080 FVP.

Descriptors: *Oil spills, *Harbors, Hydrodynamics, Riprap, Water pollution control, Pollution abatement, Oil pollution.
Identifiers: Containment boom terminator, *Oil seal, *Boom terminal gap, Construction details, *Booms.

One of the most common sources of failure in the application of floating oil booms to contain an oil spill is leakage between the end of the boom and the adjacent shoreline, deck or bulkhead. Booms cannot be fastened solidly to the shore since they must rise and fall with the changes in height due to tides and waves. The use of countercurrents generated by a fire stream or prop wash is attractive, although it ties up a boat often needed for other tasks. Furthermore, the shallow draft of a small boat allows oil to escape beneath the boat unless the boat is overlapped by the boom. Securing boom to the boat while avoiding the fouling of the boat's propeller then becomes operational concerns. A simple structure is described for mounting a small outboard motor to 'seal' the gap. This boom terminator can be constructed on-scene with tools and materials generally available around the waterfront by relatively unskilled personnel. (EPA)
W73-11437

REMOVAL OF OIL FROM UNDER PIERS,
New York City Fire Dept.
B. Katz.
Copy available from GPO Sup Doc as EP1.23/2:73-116, $0.65; microfiche from NTIS as PB-221 545, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-116, February 1973. 29 p, 3 fig, 2 ref. EPA Project 15080 FVP.

Descriptors: *Oil spills, *Oil pollution, Hydrulics, *Jets, *Piers, Docks, Boats, *Nozzles, *Emulsions, Entrainment, Pollution abatement, Water pollution control.
Identifiers: Fire departments, Surface currents, Monitor streams, Hose streams, Surface collecting agent.

While this report deals primarily with methods of extracting oil from under piers, it is recognized that simple extraction is not enough, and that the oil should also be removed from the environment. Therefore, considerable attention has been paid to driving the oil out in such a way that it can be picked up. The primary means of extraction are by the establishment of artificial currents under the contaminated pier, and a number of methods are suggested to cope with various types of pier substructure. Some other possible approaches, not involving flushing by artificial currents, are also discussed. These include: uses of chemicals, sinking, air entrainment and entombment. A generalized description of pier structures is also included. (EPA)
W73-11438

A RAPIDLY DEPLOYABLE OIL CONTAINMENT BOOM FOR EMERGENCY HARBOR USE,
New York City Fire Dept.
J. J. Cunningham.
Copy available from GPO Sup Doc as EP1.23/2:73-112, $0.65; microfiche from NTIS as PB-221 523, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-112, February 1973. 31 p, 2 fig, 6 ref. EPA Project 15080 FVP.

Descriptors: *Oil spills, *Harbors, Water pollution control, Pollution abatement.
Identifiers: *Oil spill containment boom, Fire department, *Emergency service, Performance criteria, Quiescent water, *Booms.

Performance criteria are described for an ideal oil spill containment boom for emergency harbor service. The type of boom recommended is that which an emergency service, such as a fire department or a plant team could transport promptly to a spill incident within a harbor and deploy quickly to contain the spilled oil. The experience acquired by the Marine Division of the NYFD over the course of one year, both at active spill control operations and in test exercises, serves as the principal source of information. It is hoped that information offered will lead to the development of the ideal boom as envisioned. Among the boom criteria developed are: recommended size and performance capabilities; storage and handling problems; and optimum design characteristics. (EPA)
W73-11439

NATIONAL MEAT-PACKING WASTE MANAGEMENT RESEARCH AND DEVELOPMENT PROGRAM,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 05D.
W73-11440

PREDICTION MODELING FOR SALINITY CONTROL IN IRRIGATION RETURN FLOWS,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
A. G. Hornsby.

Copy available from GPO Sup Doc as EP1.23/2:73-168, $0.90; microfiche from NTIS as PB-221 647, $0.95. Environmental Protection Technology Series Report EPA-R2-73-168, March 1973. 55 p, 6 fig, 101 ref. EPA Project 13030 GJS.

Descriptors: *Irrigation systems, Surface flow, Subsurface flow, Salt movement, Ion exchange, System analysis, Water resources, Management, Evapotranspiration, Soil physical properties, Soil moisture, *Reviews, *Return flow, *Salinity, Model studies, *Water management (Applied).

A review of the current state-of-the-art of prediction modeling as applied to salinity control in irrigation return flows is presented. Prediction models are needed to assess the effects of proposed changes in irrigation management practices on the quality of return flows. The processes which affect salinity levels in return flows are enumerated and their interactions are alluded to. Models used to predict the quantity and quality of return flows are briefly discussed to show the development of the current level of technology. The readers are referred to the original documents for more rigid development of the models and incumbent assumptions. It was concluded that technology of water and salt flow in soil systems is sufficiently developed to permit formulation of models using systems analysis to evaluate proposed changes in management practices. Development of systems models to study irrigation return flow problems and conjunctive water resource uses was recommended. (EPA)
W73-11441

ADSORPTION OF CHLORINATED HYDROCARBONS FROM SEAWATER BY A CROSSLINKED POLYMER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W73-11443

OIL/SORBENT HARVESTING SYSTEM FOR USE ON VESSELS OF OPPORTUNITY,
URS Research Co., San Mateo, Calif.
J. D. Sartor, C. R. Foget, and R. W. Castle.
Copy available from GPO Sup Doc as EP1.23/2:73-166, $1.25; microfiche from NTIS as PB-221 550, $0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-166, April 1973. 99 p, 66 fig, 19 tab, 7 ref. EPA Project 15080 HER. 68-01-0069.

Descriptors: *Oil pollution, Oil spills, *Conveyor systems, *Pollution abatement, Water pollution control.
Identifiers: *Oil recovery systems, *Oil/sorbent recovery, Sorbents.

A system for harvesting mixtures of oil and sorbent materials, primarily straw, which could be utilized for the recovery of floating oil from water was developed for use on vessels of opportunity. A three-phase test program was conducted to evaluate candidate system components and operating specifications for the oil/sorbent harvesting system. The first phase of the program involved testing individual system components and operating parameters as to their effectiveness in picking up sorbents only. The first phase was conducted under actual conditions in a saltwater slough. The second phase of the test program entailed evaluating those operating characteristics of the harvesting system components selected in the first phase using crude oil and various sorbents in a test tank. The third phase of the test program entialed the installation of the complete system on a vessel of opportunity (an LCM), and demonstration of the ability of the system to operate under actual conditions. The system was evaluated both in the San Francisco Bay and off Coal Oil Point (Santa Barbara) where sorbent materials were dispersed over natural oil slicks. The system utilizes commercially and readily available equipment which, with minor modifications was assembled on-site into available vessels. The system was very effective in recovering sorbents (straw and polyurethan foam) from the water surface. (EPA)
W73-11445

ENERGY VS. ENVIRONMENT,
For primary bibliographic entry see Field 06G.
W73-11500

REHABILITATION OF IRRIGATION SYSTEMS FOR SALINITY CONTROL,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 03F.
W73-11509

SIMULTANEOUS, MULTIPLE-LEVEL RELEASE FROM STRATIFIED RESERVOIRS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-11567

REMOVAL OF OIL FROM WATER SURFACES BY SORPTION ON UNSTRUCTURED FIBERS,
Texas Tech Univ., Lubbock. Textile Research Center.
R. F. Johnson, T. G. Manjrekar, and J. E. Halligan.
Environmental Science and Technology, Vol 7, No 5, p 439-443, May 1973. 9 fig, 3 tab, 17 ref.

Descriptors: *Sorption, *Oil spills, *Sea water, *Methodology, Oil pollution, Fibers (Plant), Physical properties, Pollutants, Water pollution, Cotton, Cellulose, Specific gravity, Temperature, Surface tension, Viscosity, Water pollution control.
Identifiers: *Oil removal, *Crude oil, *Unstructured fibers, Synthetic fibers, Natural fibers, Cleanup, Chemical composition, Water surfaces, Oil characterization, Bunker C oil, Wool, Polypropylene fibers, Acrylic fibers, Nylon 66 fibers, Polyester fibers, Cellulose triacetate, Cellulose acetate, Viscose rayon, Polyacrylonitrile, Polyhexamethylene adipamide, Polyethylene terephthalate, ENCO No. 6 fuel oil, Clearfork Field crude oil, Friendswood Field crude oil.

The capacity of unstructured fibers to remove crude oil from seawater was related to the chemical composition and surface properties of the fibers as well as the concentration, specific gravity, and temperature of the crude oil. The sorption capabilities of cotton exceeded those observed for all of the other synthetic and natural fibers tested. The amount of oil sorbed increased as the denier of the fiber decreased for all of the materials tested. For the data available, the critical surface tension of the solid sorbent was also related to the amount of oil sorbed. Cyclic sorption/desorption studies indicated that a simple squeezing operation was sufficient to remove most of the oil sorbed on the fibers and that recycling was feasible. (Holoman-Battelle)
W73-11586

PLANKTONIC CHANGES FOLLOWING THE RESTORATION OF LAKE TRUMEN, SWEDEN,
Lund Univ. (Sweden). Limnology Inst.
G. Andersson, G. Cronberg, and C. Gelin.
AMBIO, Vol 2, Nos 1/2, p 44-47, February 1973. 7 fig, 9 ref.

Descriptors: *Nutrients, *Primary productivity, *Phytoplankton, *Zooplankton, *Hydrogen ion concentration, Trophic level, Dredging, Succession, Eutrophication, Sediments, Sampling, Phosphates, Phosphorus, Ammonia, Nitrogen, Biomass, Diatoms, Water analysis, Rotifers, Pyrrophyta, Anabaena, Invertebrates, Chlorophyta, Crustaceans.
Identifiers: *Restoration, *Transparency, Melosira, Aphanizomenon flos-aquae, Microcystis aeruginosa, Dinobryon, Synura, Mallomonas, Glenodinium, Oscillatoria, Anabaena flos-aquae, Anuraeopsis fissa, Filinia longiseta, Trichocerca pusilla, Chydorus sphaericus, Bosmina longirostris, Polyarthra, Brachionus angularis, Keratella quadrata, Cladocera, Macroinvertebrates.

Restoration of Lake Trummen, a shallow oligotrophic lake near Vaxjo, Sweden, was attempted by first cutting off pollutant sources and then removing the nutrient-rich sediment by suction-dredging. Some of the changes are reported in the plankton communities in 1969 (before restoration) and 1972 (the year after restoration). Water samples were analyzed for phosphates, total phosphorus, ammonia, Kjeidahl nitrogen, pH, and transparency. Phytoplankton samples were collected at least once a month with a Ruttner sampler. Primary productivity of phytoplankton was determined by C-14 uptake. Zooplankton samples were collected in a plexiglass tube from 20 sites over 1-2 week intervals and composited for counts. Comparison of data showed that transparency increased and pH normalized after the restoration. Other primary changes occurred as follows. Biomass of phytoplankton was reduced; the massive bloom of Microcystis aeruginosa disappeared; Maxima of diatoms occurred during August rather than in Spring and autumn; Chrsophyceae and Glenodinium developed under ice; nannoplankton increased; and productivity, although not greatly different, resulted in larger part from nannoplankton. The most striking change in zooplankton was that species indicative of eutrophy (Brachionus angularis, Trichocerca pusilla, Keratella quadrata, Chydrous sphaericus) declined dramatically. (Little-Battelle)
W73-11639

MSB COMPUTERIZED COMBINED SEWER CONTROL SYSTEM,
Metropolitan Sewer Board St. Paul, Minn.
M. L. Robins.
Presented at the International Public Works Congress and Equipment Show, Annual Meeting Mineapolis, September 26, 1972. 14 p.

Descriptors: *Sewers, *Overflow, *Water pollution control, *Computer models, *Combined sewers, Minnesota, Storm runoff, Water pollution sources, Water quality control, Computer programs, Regulated flow.
Identifiers: *Combined sewer interceptors, *Mineapolis-St. Paul.

The Minneapolis-St. Paul Sanitary District assumed responsibility for all sewer overflow regulators in the area in 1965 because of the need to control combined sewer overflows in the Twin Cities. Based upon a program planned between 1956 and 1960, these regulators were studied to obtain their maximum pollution abatement utilization. The realization that rainfall patterns over the metropolitan area are seldom uniform led to the idea of controlling the regulators individually to achieve maximum storm water overflow reductions. The system was developed under a Federal Water Pollution Control Administration grant of over $850,000. Three major projects developed in 1967-1968 were: (1) basic regulator modification including hydraulically-operated gates and air-inflated fabric dams (Fabridams); (2) installation of vaults to house the equipment and controls for in-sewer instrumentation; and (3) a computer-based control system. Normally the Fabridams are fully inflated, diverting all water to the sewage treatment plant. But during a storm, a system of rainfall gauges placed around the Twin Cities, along with measurement s of in-sewer flow and river water quality, sends pertinent data to the computer. The computer can then predict sewer surcharging, excessive pressure on the Fabridams, and resultant river pollution under various options of deflating some of the Fabridams. The latter would allow combined sewer overflow to be dumped into the

Mississippi River. By using Fabridams and deflating only those which had to be deflated, the overflows to the River had been reduced in duration by about 88 percent in 1969 and about 85 percent in both 1970 and 1971. (Poertner)
W73-11673

THE NEED FOR HYDROGEOLOGIC EVALUATIONS IN A MINE DRAINAGE ABATEMENT PROGRAM: A CASE STUDY, TOMS RUN, CLARION COUNTY, PENNSYLVANIA,
Pennsylvania Dept. of Health, Harrisburg. Bureau of Sanitary Engineering.
G. L. Merritt, and G. H. Emrich.
Mellon Institute, Third Symposium on Coal Mine Drainage Research, Pittsburgh, May 19-20, 1970. p 334-364, 14 fig, 10 tab, 11 ref.

Descriptors: *Water pollution control, *Mine drainage, *Hydrogeology, *Acid mine water, Pennsylvania coal mine wastes, Industrial wastes, Water pollution sources, Data collections, Evaluation, Assessments, Water pollution control.
Identifiers: *Toms Run, *Hydrogeologic evaluations.

In the Toms Run drainage basin in Pennsylvania, the development of oil, gas, and coal resources has created many water pollution problems, through the changing of the hydrogeologic properties within the aquifers. The quality of groundwater in the Toms Run is affected by mine drainage and varies depending on the proximity of the drainage basin to the mining. The secondary iron deposits in the Toms Run basin, although long thought to be from oil and gas well brines, are also found to be from the coal mine drainage moving through the aquifers. The major pollution of the Toms Run is from the coal mining operations. The oil and gas wells act as conduits to move the acid mine drainage from the surface to underlying aquifers. Thus, to solve the problems of the Toms Run, it is necessary to back-fill and restore coal strip mines both inside and outside the drainage basins and to clean up the acid iron-rich springs present in the area. Geology and hydrogeology are discussed in detail, because an accurate knowledge of these factors is important to be understanding of the problem. (Poertner)
W73-11674

HYDROGEOLOGIC CONSIDERATIONS FOR SEALING COAL MINES,
Pennsylvania Dept. of Health, Harrisburg. Bureau of Sanitary Engineering.
D. R. Thompson, and G. H. Emrich.
Publication Number 23, August, 1969. 21 p, 11 fig, 6 ref.

Descriptors: *Mine drainage, *Soil sealants, *Coal mine wastes, *Seepage control, *Sealants, *Hydrogeology, Acid mine water, Water pollution control, Pennsylvania, Water pollution sources, Mining, Mining engineering, Mine acids.
Identifiers: Air sealing, Water-tight sealing.

Coal mine pollution is the major source of water pollution in Pennsylvania. More than 2,000 miles of rivers in the state are adversely affected by coal mine drainage. A solution to stopping coal mine drainage could drastically improve Pennsylvania water quality. Two basic types of mine sealing exist--water-tight sealing and air sealing. The basic principle of air sealing is to prevent oxygen from entering the mine to prevent oxidation of pyrites and the formation of sulphuric acid. Accomplished by several methods, but basically by covering the mine shaft with earth, the use of air seals in past years has not been effective in preventing pollution and water-tight seals are now necessary. In this method, the mine shaft portal is blocked by an impervious material such as concrete to allow the mine to fill with natural groundwater and to exclude groundwater seepage from the mine. However, geological considerations must still be taken into consideration, especially groundwater flow, direction and pressure. The water-tight seal must be of sufficient strength to resist the groundwater pressure, must be supported on all sides by rock of sufficient strength, and must be placed in a position to actually keep the groundwater from leaving the mine. By conducting mining operations with future planning for seals, water-tight seals should provide adequate protection to halt much of the coal mine drainage pollution problem. Double-wall seals are suggested for added protection. (Poertner)
W73-11675

LEACHATE QUALITY FROM ACIDIC MINE SPOIL FERTILIZED WITH LIQUID DIGESTED SEWAGE SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
J. R. Peterson, and J. Gschwind.
Presented before Div. A-5, American Society of Agromony, New York, August 17, 1971. 16 p, 2 tab, 2 fig, 10 ref.

Descriptors: *Coal mine wastes, *Mine drainage, *Sludge disposal, Neutralization, Water pollution control, Fertilization, Leaching, Laboratory tests, Illinois.
Identifiers: Chicago.

The spoils from coal strip-mining sometimes contain sulfide minerals which, when oxidized, produce substantial quantities of sulfuric acid. These acids are harmful in themselves but also increase the solubility of the metals contained in the strip mined spoil. These metals are often toxic to plant growth and as a result, strip mined spoils are often barren of vegetation. The Metropolitan Sanitary District of Greater Chicago is seeking solutions to this problem and, in this paper, presents the results of one attempted solution, the application of digested sewage sludge. Four plexiglass columns were filled with mine spoilage and varying quantities and mixtures of sludge. After saturating the columns initially, and then adding constant volumes of aerated deionized water each day, the resultant leachate was collected from the four columns and analyzed for pH, phosphorus, nitrogen, sulfates, total acidity, electrical conductivity and twelve metals. The digested sludge when used in a proportion of 1:37 by weight, with mine spoilage, changed the pH from 2.5 to 4.6 and reduced aluminum by 99 percent, iron by 80 percent, and soluble salts by 41 percent. On the other hand, SO4 increased by 49 percent Mg by 827 percent, NH3-N by 1689 percent and Zn by 1941 percent. The leaching test ran for 110 days, and the use of a sludge-spoil mixture underlain by a spoil layer produced almost no change in leachate quality from the pure spoil column. The addition of sludge increased infiltration, and reduced runoff from mine spoil wastes. (Poertner)
W73-11680

SUPPLEMENTATION OF MISSING VALUES IN WATER QUALITY DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
K. P. R. Krishnan, L. T. Fan, and L. E. Erickson.
Water Resources Bulletin, Vol 9, No 3, p 455-466, June, 1973. 3 fig, 4 tab, 11 equ, 7 ref.

Descriptors: *Water quality control, *Data collections, *Ohio River, *Statistical methods, *Dissolved oxygen, Equations, Evaluation, Methodology, Water temperature.
Identifiers: *Linear interpolation, *Harmonic analysis, Sample variance, Missing data estimation.

In the analysis of continuous records of water quality data from automatic monitors, periods of missing values through failure to record, gross errors in recording, or accidents are frequently encountered. The problem of estimating missing values in water quality data using linear interpolation and harmonic analysis is studied to see which one of these two methods yields better estimates for the missing values. The data used in this study consists of midnight values of dissolved oxygen from the Ohio River collected over a period of one year at Stratton station. The results indicate that records with less than ten percent of missed data could be supplemented using either of the two methods; linear interpolation is suggested since it is easier to apply. When the percentage of missed data points exceeded ten percent of the total number in the original sample, harmonic analysis usually yielded better estimates for both the regularly and irregularly missed cases. For data that exhibit cyclic variation, examples of which are dissolved oxygen concentration and water temperature, harmonic analysis as a data generation technique appears to be superior to linear interpolation. At percentages higher than fifty, the missing data can be estimated; however, these situations are rarely encountered and statistical tests indicate that in such situations neither of the two methods yields reasonable estimates. (Bell-Cornell)
W73-11687

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

TOWARD A PHILOSOPHY OF PLANNING: ATTITUDES OF FEDERAL WATER PLANNERS,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. H. Wilson.
Copy available from GPO Sup Doc as EP1.23/3:73-015, $2.60; microfiche from NTIS as PB-221 433, $0.95. NTIS PC$5.10. Environmental Protection Agency, Socioeconomic Environmental Studies Series Report, EPA-R5-73-015, March 1973. 224 p, 30 tab, 55 ref. EPA Project 16110 DWX.

Descriptors: *Planning, *Attitudes, *Federal government, Administrative agencies, *Federal project policy, *Decision making, Water policy, Management, Employee relations.

Interviews were conducted with 70 planners from federal water resources agencies to determine their attitudes toward planning objectives, their personal role in planning, the social-political structure, time, and the environment. Responses of the planners are summarized and compared with views of others on the proper role of the planner in the planning process. Some conclusions as to methods in improving the planning process are presented. (Linsley-Stanford)
W73-11073

ITERATIVE SIMULATION ALGORITHM IN RESERVOIR SYSTEMS OPERATION,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-11139

DISAGGREGATION PROCESSES IN STOCHASTIC HYDROLOGY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-11141

BEHAVIOR OF GROUNDWATER FLOW SUBJECT TO TIME-VARYING RECHARGE,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 02F.
W73-11142

PEAK LOAD PRICING MODEL OF AN ELECTRIC UTILITY USING PUMPED STORAGE,
Boston Univ., Mass. Dept. of Economics.
R. Jackson.
Water Resources Research, Vol 9, No 3, p 556-562, June 1973. 4 fig, 11 ref.

Descriptors: *Electric power, *Water resources, *Peak loads, *Pricing, *Pumped storage, *Optimization, Evaluation, Powerplants, Operating costs, Mathematical models, Systems analysis.
Identifiers: *Equilibrium welfare economics, Welfare maximization.

Electric utilities are increasing their use of water power to supplement system capacity during peak demand intervals. During off-peak periods, electricity derived from fuel generators is used to store water, and when the peak period arrives, the demand is satisfied by production from both fuel and hydroelectric generators. This pumped storage technique is particularly well-suited to nuclear plants that cannot be 'turned off' during low demand intervals. Presented is a peak load pricing model, based on partial equilibrium welfare criteria, for determining the optimal prices in the peak and off-peak periods and the amount of electric power that should be used during the off-peak intervals to pump water. Current peak load models have always assumed that the consumption and the production of electricity are instantaneous and have not considered the storage possibility by using water resources. A pricing rule for welfare maximization emphasizing capacity charges is first derived, and then a graphical model is developed that can be adapted to the installation of a particular utility. A method of evaluating plant expansion programs by using the model is also indicated, the benefits from increased consumption and lower operating costs being compared to the additional capacity cost. (Bell-Cornell)
W73-11146

PROGRESSIVE TAXATION AS A POLICY FOR WATER QUALITY MANAGEMENT,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-11147

PROGRAMING MODEL FOR EVALUATING ECONOMIC AND FINANCIAL FEASIBILITY OF IRRIGATION PROJECTS WITH EXTENDED DEVELOPMENT PERIODS,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-11149

AN ENVIRONMENTAL EVALUATION SYSTEM FOR WATER RESOURCE PLANNING,
Battelle Columbus Labs., Ohio.
N. Dee, J. Baker, N. Drobny, K. Duke, and I. Whilman.
Water Resources Research, Vol 9, No 3, p 523-535, June, 1973. 15 fig, 2 tab, 10 ref.

Descriptors: Water resources development, Projects, *Planning, *Environment, *Evaluation, *Methodology, Multiple-purpose projects, Estimating, Systems analysis, Pollution, Social aspects.
Identifiers: *Environmental impact analysis, *Environmental quality.

The Environmental Evaluation System (EES) is a methodology for conducting environmental impact analysis. Developed by an interdisciplinary research team, it is based on a hierarchical arrangement of environmental quality indicators that classifies the major areas of environmental concern into major categories, components, and ultimately into parameters and measurements of environmental quality. The EES provides for environmental impact evaluation in four major categories: Ecology, environmental pollution, esthetics, and human interests. These four categories are further broken down into 18 components and finally into 78 parameters. The method provides a means for measuring or estimating selected environmental impacts of large-scale water resource development projects in commensurate units termed 'environmental impact units' (EIU). Results of using EES include a total score in EIU with and without the proposed project; the difference between the two scores is one measure of environmental impact. Environmental impact scores developed in the EES are based on the magnitude of specific environmental impacts and their relative importance. Another major output from EES is an indication of major adverse impacts called 'red flags', which are of concern of and by themselves. These flags indicate fragile elements of the environment, which must be studied in more detail. (Bell-Cornell)
W73-11151

STOCHASTIC RESERVOIR MANAGEMENT AND SYSTEM DESIGN FOR IRRIGATION,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 03F.
W73-11152

QUALITATIVE VALUES IN ENVIRONMENTAL PLANNING: A STUDY OF RESOURCE USE IN URBANIZING WATERSHEDS,
Harvard Univ., Cambridge, Mass., Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W73-11253

THE ESTIMATION OF THE HYDROLOGICA IMPACT OF URBANIZATION: AN EXAMPLE OF THE USE OF DIGITAL SIMULATION IN HYDROLOGY,
University Coll., London (England).
For primary bibliographic entry see Field 04C.
W73-11259

NONLINEAR PARAMETER ESTIMATION IN WATER QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-11361

DISCRETE GRADIENT OPTIMIZATION OF WATER SYSTEMS,
Medical Univ. of South Carolina, Charleston. Dept. of Biometry.
For primary bibliographic entry see Field 08B.
W73-11365

A DYNAMIC PROGRAMMING APPROACH FOR INVESTMENT STRATEGIES IN WASTEWATER TREATMENT PLANTS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-11426

A MATHEMATICAL MODEL TO AID MANAGEMENT OF OUTFLOW FROM THE OKAVANGO SWAMP, BOTSWANA,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
I. P. G. Hutchison, and D. C. Midgley.
Journal of Hydrology, Vol 19, No 2, p 93-112, June 1973. 11 fig, 8 ref.

Descriptors: *Mathematical models, *Water management (Applied), *Water supply, Streamflow forecasting, Swamps, Africa, Vegetation effects, Geology, Evapotranspiration.
Identifiers: *Okavango River (Botswana).

A series of mathematical models permits a 20-year sequence of flows to be routed through a complex river and swamp system. This allows simulation of the behavior of the Mopipi off-channel storage from which the Orapa Diamond Mine, Botswana, draws its water supply. Although the diversion would have met the design demand throughout the simulation period, the source area is highly sensitive to relatively minor vegetational changes and possibly also to seismic activity. For this reason, coupled with the fact that future developmental pressures are likely to conflict with the desire to preserve this wilderness environment, the scope of the model should be widened to embrace the whole of the Okavango delta. (Knapp-USGS)
W73-11543

LINEAR PROGRAMMING USE FOR EVALUATING WATER RESOURCES AND COST AND BENEFIT ALLOCATION,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. A. Andrews, and R. R. Weyrick.
Water Resources Bulletin, Vol 9, No 2, p 258-272, April, 1973. 4 fig, 7 tab, 5 ref.

Descriptors: *Linear programming, *River basins, *Multiple purpose, *Water resources, *Evaluation, *Cost allocation, *Resource allocation, *New Hampshire, Optimization, Benefits, Surface waters, Water users, Lakes, Recreation, Shores, Industries, Waste water (Pollution), Constraints, Coliforms, Biochemical oxygen demand, Computer programs.
Identifiers: *Ashuelot River (N.H.), Implicit prices, Price sensitivity, Objective functions, River-flow levels, Economic activity.

The results of using linear programming to evaluate water resources and cost and benefit allocation of surface water uses in a small southern New Hampshire river basin are presented. The model includes almost all water-related economic activity both for consumers and producers and can analyze the entire basin or basin sub-division. It includes seven sectors, nine objective function criteria, and three river-flow levels, and contains 132 equations and 218 activities. The activities include water use, production and consumption activities, wastewater treatment, and water transfer activities from one use to another. To recognize the most limiting river water flow and water resource use, the period analyzed is the month of August. The incidence of benefits and costs is shown to shift with objective optimized and river flow level. The disposal of untreated household wastewater, particularly from the rural household, directly into the river is consistent with maximizing net benefits and minimizing costs. The optimum resource allocation, water-treatment plants, farms and industry activities would change with flow level. For each of the three industries analyzed separately--paper, wool and tanning--public treatment of industrial wastewater is the optimal treatment process in one or more of the solutions. Lake shoreline is the dominant feature determining lake-resource valuation. (Bell-Cornell)
W73-11683

ON LARGE DIVERSIONS FROM THE NORTHWEST--NORMAL AND HIGH-FLOW YEARS,
Washington State Univ. Pullman. Dept. of Computer Science.
R. D. Dutton, and C. B. Millham.
Water Resources Bulletin, Vol 9, No 2, p 231-242, April, 1973. 8 tab, 9 ref.

Descriptors: *Columbia River, *Pacific Northwest U.S., *Diversion losses, *Economics, *Dams, Pollution abatement, Assessments, Mathematical models, Systems analysis.
Identifiers: *Snake River, Power generation, Brownlee Da m, McNary Pool.

This work assesses economic losses due to diversion of Snake and Columbia River waters. It is a sequal to the work of Millham and Russell (1971), which used a 3-dam, 6-time-period model to assess the economic losses accruing to the Pacific Northwest due to diversion in low-flow years of Snake River waters above Brownlee Dam to other geographical regions; its data, derived in 1967, is now out-of-date because of the rapid escalation of nuclear power costs. This effort demonstrates a 7-dam, 12-time-period model capable of handling high flows, and presents power replacement costs, based on current thermal plant construction costs, for the significant dams of the Snake-Columbia basin. The model and data are applied to an assessment of the losses that would accrue to the Pacific Northwest from diversions above Brownlee Dam in low, normal, and high-flow years and also from diversions out of McNary Pool during the same years. The tool used is dynamic programming. Only losses due to lost power generation (1972 cost figures) and pollution abatement capability, projected for the year 1990, are included, but data from fisheries and recreation could be incorporated if it were available. (See also W72-02124) (Bell-Cornell)
W73-11685

EXPERIMENT IN THE USE OF DIGITAL COMPUTERS TO DETERMINE TRAVELTIME ON A TRIBUTARY REACH OF A RIVER (OPYT ISPOL'ZOVANIYA ETSVM PRI OPREDELENII VREMENI DOBEGANIYA NA PRITOCHNOM UCHASTKE REKI),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-11692

USE OF DIGITAL COMPUTERS TO COMPUTE PROPAGATION OF FLOOD WAVES ALONG THE CASCADE OF RESERVOIRS ON THE DNIEPER RIVER (PRIMENENIYE ETSVM DLYA RASCHETA RASPROSTRANENIYA VOLN POLOVODIY PO KASKADU GIDROUZLOV NA DNEPRE),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-11693

6B. Evaluation Process

PEAK LOAD PRICING MODEL OF AN ELECTRIC UTILITY USING PUMPED STORAGE,
Boston Univ., Mass. Dept. of Economics.
For primary bibliographic entry see Field 06A.
W73-11146

COST-EFFECTIVENESS METHODOLOGIES FOR DATA ACQUISITION IN WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-11150

ECOLOGIC-ECONOMIC ANALYSIS FOR REGIONAL DEVELOPMENT. SOME INITIAL EXPLORATIONS WITH PARTICULAR REFERENCE TO RECREATIONAL RESOURCE USE AND ENVIRONMENTAL PLANNING,
W. Isard.
Free Press: New York, N.Y., Collier-Macmillan Ltd.: London, England, 1972. 270 p, Pr. $11.95. Illus.
Identifiers: Books, *Ecologic-economic analysis, Environmental planning, Explorations, Planning, *Recreational use, Resources, *Regional development.

This book discusses several traditional economic and regional science techniques for regional analysis, giving the reader some idea of how standard techniques may be employed, particularly as they apply to continental shelf resource evaluation. Next, it covers natural resources from an extra-economic standpoint, briefly discussing resource classification and several critical ecologic principles. It then illustrates how these principles and their associated subsystems-the food chain, photosynthesis, and the P cycle-can be put into an input-output, programming format paralleling procedures in economics and regional science. The next section develops an interrelations table to record flows among activities, illustrating how the ecologic and economic systems are interrelated via these flows. Next a case study is presented, considering the general plymouth-Kingston-Duxbury Bay area. Finally, the book enumerates the possibilities of study for the further development of a methodology for the synthesis of economic and ecologic analyses, as well as discussing the interrelations among resource development, economic growth and comprehensive coastal zoning.--Copyright 1972, Biological Abstracts, Inc.
W73-11176

THE EVOLVING ROLE OF THE FEDERAL GOVERNMENT IN THE MANAGEMENT OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 06E.
W73-11247

WATER SUPPLY PLAN FOR THE SOUTHEASTERN CONNECTICUT REGION, VOLUME II, RECOMMENDED PLAN.
Southeastern Connecticut Water Authority, Norwich; and the Southeastern Connecticut Regional Planning Agency, Norwich.

February 1970. 100 p, 11 fig, 6 tab, 26 ref. U.P.A. Conn. P-104.

Descriptors: *Planning, *Water supply, Water sources, Water demand, Administration, Groundwater, Costs, Water distribution (Applied), *Connecticut.
Identifiers: Load centers, Service areas.

This is the second phase of the water supply study and plan formulation being carried out jointly by the Southeastern Connecticut Water Authority and the Southeastern Connecticut Regional Planning Agency. The Water Authority was created in 1967 and given broad powers to deal with increasing growth and water demands. It is working closely with the town governments in the region and is using the regional development plan produced by the Regional Planning Agency as a guide. The study looks at all the previous water supply studies for the area, projects water demands using the concept of primary load or demand centers, surveys existing and potential sources of water supply, recommends a water supply plan for the central urban area and seven load centers, and discusses the costs and administration involved. The study emphasizes the joint use of surface water and groundwater so that the surface water can also be used for other purposes such as recreation. Numerous maps and charts are included. (Elfers-North Carolina)
W73-11249

REGIONAL WASTE WATER, SOLID WASTE DISPOSAL, WATER SUPPLY, AND STORM DRAINAGE SYSTEMS APPRAISAL.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-11252

PUBLIC PARTICIPATION IN URBAN WATER PLANNING,
Fort Lewis Coll., Durango, Colo.
T. C. Ferrara, K. A. Romstad, and W. K. Johnson.
Journal of the Urban Planning Division, American Society of Civil Engineers, Vol 97, No UP2, p 179-190, December, 1971. 3 fig, 2 tab, 6 ref, 1 append.

Descriptors: *Planning, Information exchange, Land use, Flood control, Watersheds, Coordination, Decision-making, Groundwater, *Urbanization, *California.
Identifiers: *Public participation, *Public interests, Morrison Creek (Calif), Sacramento County (Calif).

This is an analysis of public participation in the preliminary planning for flood control in the Morrison Creek watershed near Sacramento, California. Public participation in planning is often advocated but seldom satisfactorily achieved. The analysis stresses the importance defining the public and their interests early in the planning process and establishing strong communication links such as workshops and public information meetings. The article contains tables and charts defining the public and private participants, their interests, and an information flow chart. In this particular case, private organizations, conservation organizations, and individuals were able to exert substantial influence on the preliminary alternatives for the watershed. A key element in the planning and public participation process was local government's formulation of a definitive land use policy as a basis for communication and decision-making. Active participation by state and federal agencies was also important. (Elfers-North Carolina)
W73-11257

COMPREHENSIVE WATER SEWER PLAN FOR BALDWIN COUNTY, ALABAMA.
Polyengineering, Mobile, Ala.
For primary bibliographic entry see Field 05D.
W73-11261

COMPREHENSIVE WATER AND SEWER PLAN FOR ESCAMBIA COUNTY, ALABAMA.
Polyengineering, Mobile, Ala.
For primary bibliographic entry see Field 05D.
W73-11262

PUBLIC UTILITIES IN WINNEBAGO COUNTY.
City-County Planning Commission, Rockford, Ill.
For primary bibliographic entry see Field 03D.
W73-11263

RESEARCH AND DEVELOPMENT IN WATER RESOURCES, WATER RESOURCES RESEARCH, ITS ROLE IN THE TOTAL R AND D SPECTRUM,
National Water Commission, Arlington, Va.
J. S. Gladwell.
Available from the National Technical Information Service as PB-210 823, $6.75 in paper copy, $0.95 in microfiche. Report NWC-EES-72-050, (Special Study No. 20a), January 1972. 240 p, 7 fig, 19 tab, 67 ref.

Descriptors: *Research and development, *Research priorities, *Planning, *Federal Government, *Management, *Water policy, Costs, Technology, Institutions, Manpower, Training, Universities, Economics, Operations, Water Resources Research Act.
Identifiers: Interdisciplinary research, Basic research, Applied research, Development, Appropriations, Geographic distribution, R and D Funding.

This report reviews, with special emphasis on policy implications, the role of water resources research within the total Federal and non-Federal

R and D spectrum. Although the actual dollar outlay has increased in water research, both (1) the relative effort with respect to other investments and (2) the actual effort in terms of the real value of the dollar investments have indicated a decreasing emphasis on the water aspects of science. The general condition of Federal research (and water research in particular), however, is healthy. However, no single agency or group can be identified as having the 'lead' in water research. The study points to the Office of Water Resources Research as having the greatest potential for this role, but that it is limited by present administrative arrangements. It recommends a national institute for water resources research responsive to all, yet not under the direction of any single agency. Such an Institute (NIWRR) would use OWRR's concept as a core of responsibilities. It would be a focal point of Federal and non-Federal interests in water resources research. Water research would be emphasized as a planning and management tool. Planning and development of programs require both federal and non-federal participation. (OWRR)
W73-11341

THEORY AND PRACTICE OF PUBLIC PARTICIPATION IN PLANNING,
Georgia Inst., of Tech., Atlanta.
G. E. Willeke.
Preprint, American Society of Civil Engineers, Natl Water Resour Eng Meet, Washington, DC, Jan-Feb 1973. 21 p, 6 fig, 5 ref.

Descriptors: *Planning, Water resources, Communication, Sociology, Political aspects, Social impact, Social aspects, *Decision making, Psychological aspects.
Identifiers: Briefing, Public affairs, Workshops, *Public opinion.

Communications, sociology and social psychology, and political science provide the principal theoretical base for public participation programs. Planners more readily accept improved communications than other disciplines as a starting point for public participation program development. Techniques used to involve the public include workshops, forums, familiarization tours, brochures, opinion surveys, pro and con sheets, participation scorecards, briefings, and modified public hearings. Generally, the successes have been impressive and rather easy to obtain. Failures usually have not been permanent and do not necessarily cast doubt on the theoretical base. Primary contributions of communications theory are 2-way communication, multistep flow, and multiple entry into the system. Contributions of sociology and social psychology are the notion that planning is a social process, the concept of perception, and the concepts of trust, legitimacy, and rapport. Political science categorizes the political systems into democratic and elitist structures, orderliness, and conformance with law and principle. (USBR)
W73-11510

ECONOMIC GROWTH AND ENVIRONMENTAL IMPACT: EVALUATING ALTERNATIVES,
University of Southern California, Los Angeles.
N. M. Kamrany.
Socio-Econ Plann Sci, Vol 7, No 1, p 37-53, Feb 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Planning, Decision making, Political aspects, *Environmental effects, Methodology, Evaluation, *Social aspects, Political constraints, Input-output analysis, Cost-benefit analysis, Economic feasibility, Bibliographies, Environmental engineering, Economic impact.
Identifiers: Environmental evaluation, Heuristic methods, Environmental policy, Environmental quality.

This exploratory policy planning paper aims to bring together societal, environmental, and growth factors into a unified planning method. The growth factor is traditionally emphasized in planning, but environmental and societal considerations are emphasized in this scheme. Cost of negative environmental impacts of economic growth projects should be subtracted from the value of economic growth projects and their impacts on society should be assessed. Prinicpal elements in the systematic framework suggested for developing an economic growth strategy are: (1) identifying major alternatives, which involves considering public and private policies; (2) evaluating the chosen alternatives based on economic and environmental considerations; and (3) setting priorities and selecting alternatives based on policy-effectiveness and cost-benefits. This methodology is useful in structuring and summarizing an enormous amount of information and applying collective judgments on a large number of National goals (USBR).
W73-11511

CONSTRUCTION DIFFICULTY INDEX FOR TUNNEL CONSTRUCTION,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 08H.
W73-11681

LINEAR PROGRAMMING USE FOR EVALUATING WATER RESOURCES AND COST AND BENEFIT ALLOCATION,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 06A.
W73-11683

AESTHETIC PREFERENCE FOR WATER RESOURCE PROJECTS: AN APPLICATION OF Q METHODOLOGY,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
S. E. Gauger, and J. B. Wyckoff.
Water Resources Bulletin, Vol 9, No 3, p 522-528, June , 1973. 7 p, 7 ref.

Descriptors: *Aesthetics, *Preferences (Water rights), *Water resources, *Projects, *Intangible benefits, *Measurement, Planning, Photography, Natural resources.
Identifiers: Factor analysis, Q methodology.

Many resources which generate aesthetic and visual benefits are publically owned and their optimum use and development depends upon public investment. Traditionally, public investment decisions have been couched in economic terms requiring quantitative measurement of benefits and costs. Many of the benefits these resources provide are not consumed when they are enjoyed; thus, if the total contribution of the resource is measured in the conventional market sense, less than socially optimal investment may occur. Presented is a study designed to investigate whether aesthetic preferences related to water projects can be determined, and whether they differ among different groups of people. A Q sort of 44 photographs of a wide variety of water development projects was conducted with two groups: Photographers (aesthetic man) and town assessors (economic man). In the resultant analysis, aesthetic preferences were consistent between the two groups tested. The test revealed that people do not necessarily equate only naturalness with aesthetic appeal, but will accept development as aesthetic, provided that it is designed to complement the natural landscape. (Bell-Cornell)
W73-11684

ON LARGE DIVERSIONS FROM THE NORTHWEST--NORMAL AND HIGH-FLOW YEARS,
Washington State Univ. Pullman. Dept. of Computer Science.
For primary bibliographic entry see Field 06A.
W73-11685

FORMATION AND FORECAST OF COMPONENTS IN THE HYDROLOGIC REGIMEN OF RIVERS (FORMIROVANIYE I PROGNOZY ELEMENTOV GIDROLOGICHESKOGO REZHIMA REK).
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-11688

PRECOMPUTATION OF A SPRING-FLOOD HYDROGRAPH BASED ON HYDROMETEOROLOGICAL DATA (PREDVYCHISLENIYE GIDROGRAFA VESENNEGO POLOVOD'YA PO GIDROMETEOROLOGICHESKIM DANNYM),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-11689

FORECASTING QUARTERLY INFLOW OF WATER TO DNIEPER RIVER RESERVOIRS DURING THE COLD HALF OF THE YEAR (O PROGNOZIROVANII KVARTAL'NOGO PRITOKA VODY V DNEPROVSKIYE VODOKHRANILISHCHA ZA KHOLODNUYU POLOVINU GODA),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02H.
W73-11691

FORECASTING TIME OF FORMATION OF COMPLETE ICE COVER IN THE UPPER DNIEPER BASIN (O PROGNOZIROVANII SROKOV NASTUPLENIYA LEDOSTAVA V BASSEYNE VERKHNEGO DNEPRA),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02C.
W73-11695

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM,
Northern Maine Regional Planning Commission, Presque Isle.
For primary bibliographic entry see Field 05D.
W73-11079

PROGRESSIVE TAXATION AS A POLICY FOR WATER QUALITY MANAGEMENT,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-11147

URBANIZATION'S DRAINAGE CONSEQUENCE,
Nolte (George S.) and Associates, San Jose, Calif.; and San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 04C.
W73-11254

COMMUNITY IMPROVEMENTS AND SERVICE COSTS,
South Dakota State Univ., Brookings.
For primary bibliographic entry see Field 03D.

W73-11255

LEAST COST METHOD FOR SEWER DESIGN,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05G.
W73-11360

MULTILEVEL CONTROL OF MULTIPOLLUTANT SYSTEM,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
For primary bibliographic entry see Field 05G.
W73-11363

A DYNAMIC PROGRAMMING APPROACH FOR INVESTMENT STRATEGIES IN WASTEWATER TREATMENT PLANTS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-11426

TOTAL MERCURY AND METHYLMERCURY CONTENT OF THE AMERICAN EEL (ANGUILLA ROSTRATA),
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
H. C. Freeman, and D. A. Horne.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 454-456, March 1973. 1 tab, 8 ref.

Descriptors: *Mercury, *Pollutant identification, *Chemical analysis, Marine fish, Eels, Heavy metals, Saline water fish, Canada.
Identifiers: *Methylmercury, *Anguilla rostrata, *Muscle, American eel, Animal tissues, Semimicro gas liquid, Chromatography, Flameless atomic absorption spectrophotometry, Organometallics, Medway River, Organomercury compounds.

Two groups of American eels (Anguilla rostrata) obtained from the Medway River in Nova Scotia were analyzed for the prescence of mercury. Homogenates were prepared from about 50 percent of the dorsal muscle using a blender; portions of the same homogenate were used for both total mercury and methylmercury determinations. Total Hg and methylmercury were determined in duplicate on each homogenate by the semiautomated flameless atomic absorption method of Armstrong and Uthe (1971) and the semimicro gas-liquid chromatography method of Uthe et al (1972), respectively. The total mercury content was 0.72 plus or minus 0.05 ppm and the methylmercury content was 0.40 plus or minus 0.06 ppm (mean plus or minus SE for 23 fish). Since the mean total mercury content was less than 1 ppm and the toxic methylmercury content was 50 percent of this, or less than the 0.5 ppm guideline, such eels may be acceptable for human consumption. (Holoman-Battelle)
W73-11576

FINANCING PRIVATE WATER RESOURCE DEVELOPMENT: ANALYSIS OF A STATE LOAN PROGRAM,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W73-11686

6D. Water Demand

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY : APPENDIX H, MINERALS.
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-11107

SCOPE OF PUBLIC WATER SUPPLY NEEDS.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.

November 1, 1972. 149 p, 10 fig, 48 tab, 26 ref, 4 append.

Descriptors: *Water supply, *Water demands, *Future planning, Projections, Forecasting, Safe yield, Management, Water resources development, *New York.
Identifiers: Southeastern New York.

This study of the future water supply needs of the southeastern New York area focuses on the years 2000 and 2020 and concludes that projected population increases and greater commercial and industrial demands for water will create water supply deficits in the neighborhood of 800 mdg. These deficits can be met by reducing demands via conservation programs, by new technological developments such as groundwater recharge, and by developing new sources of water. The report is divided into five basic parts: (1) population analysis and projections; (2) inventory of water systems existing in southeastern New York; (3) forecasts of public water supply needs, particularly industrial; (4) analysis of the safe yield of the existing water supply systems and sources, e.g. the reservoirs in the headwaters of the Delaware River basin and the wells on Long Island; and (5) estimates of future deficits in water supply without new development and improved management. Detailed appendices on the above forecasts and inventories are included. (Elfers - North Carolina)
W73-11245

WATER SUPPLY PLAN FOR THE SOUTHEASTERN CONNECTICUT REGION, VOLUME II, RECOMMENDED PLAN.
Southeastern Connecticut Water Authority, Norwich; and the Southeastern Connecticut Regional Planning Agency, Norwich.
For primary bibliographic entry see Field 06B.
W73-11249

COMPREHENSIVE REGIONAL WATER AND SEWER INVENTORY AND ANALYSIS,
Alabama-Tombigbee Rivers Regional Planning and Development Commission, Camden.
For primary bibliographic entry see Field 07B.
W73-11670

ON LARGE DIVERSIONS FROM THE NORTHWEST--NORMAL AND HIGH-FLOW YEARS,
Washington State Univ. Pullman. Dept. of Computer Science.
For primary bibliographic entry see Field 06A.
W73-11685

6E. Water Law and Institutions

AN ECONOMIC ANALYSIS OF FLOOD DAMAGE REDUCTION ALTERNATIVES IN THE MINNESOTA RIVER BASIN,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 06F.
W73-11055

PROTECTION AND CONTROL OF THE SALT WATER SHORE AREA.
Rhode Island Statewide Planning Program, Providence.

Available from NTIS Springfield, Va. 22151 as PB-212 886, Price $3.00 printed copy; $0.95 microfiche. Technical Paper No 21, May 1972. 39 p, 10 fig, 8 ref, 1 append. RI-01-06-1003.

Descriptors: *Shore protection, *Coasts, *Rhode Island, *Erosion control, Methodology, Legal aspects, State governments, Littoral drift, Waves (Water), Ocean waves, Storms, Public lands, Reviews, Planning.
Identifiers: Private property regulations.

A possible approach is explored for the protection and regulation of Rhode Island's immediate saltwater shoreline. The report points out the critical nature of this area, discusses public and private interests in the shore area, describes past efforts to delineate a 'critical area' along the shore, and offers recommendations for protection and regulation. The designation of critical areas by a state for purposes of controlling the use and development of land is gaining wider acceptance. In Rhode Island, legislation has been enacted authorizing the application of special controls to historic districts, and in some cases to individual structures of historic value. At the federal level, the national land-use policy bills being considered by Congress recognize this technique as one means of expressing and implementing land-use policies. The appendix contains suggested legislation of two types: one to improve protection of coastal wetlands and one to regulate the entire immediate shoreline area. (Woodard-USGS)
W73-11114

THE EVOLVING ROLE OF THE FEDERAL GOVERNMENT IN THE MANAGEMENT OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
W. L. Jackson.
Available from the National Technical Information Service as COM-72-11436. Sea Grant Technical Report No 24, May 1972. 129 p, 7 fig, 43 ref, 4 append. MICHU-SG-72-209.

Descriptors: *Water management, *Comprehensive planning, *Legislation, *Federal government, Institutions, Coordination, Governments, Water policy, *Lake Michigan, *Interstate commissions.

Lake Michigan is a very valuable water resource and provides benefits for such uses as water supply, shipping, fishing, waste disposal, recreation, wildlife habitat, and shoreline aesthetics. However, as demands for these uses increase, various conflicts among them become quite critical. Management of these uses has been very fragmented and single-purpose oriented. There is now a great need for comprehensive and coordinated planning and management of the Lake and its uses. A key element in such planning and management could be the federal government via strong enforcement of existing legislation, particularly in relation to water quality, and leadership in coordination among federal, state, and local agencies. Emphasis in the report is on tracing federal activity in water resource management, in general, and relating this to the case of Lake Michigan, including the Lake Michigan Enforcement Conference and the Great Lakes Basin Commission. (Elfers - North Carolina)
W73-11247

RESEARCH AND DEVELOPMENT IN WATER RESOURCES, WATER RESOURCES RESEARCH, ITS ROLE IN THE TOTAL R AND D SPECTRUM,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W73-11341

HYDROLOGY AND WATER RESOURCES DEVELOPMENT IN NEPAL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-11401

REPORT OF THE UNITED STATES DELEGATION VISIT TO THE SOVIET UNION: JULY 24 TO AUGUST 6, 1972,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08C.
W73-11508

6F. Nonstructural Alternatives

AN ECONOMIC ANALYSIS OF FLOOD DAMAGE REDUCTION ALTERNATIVES IN THE MINNESOTA RIVER BASIN,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
A. R. Hopeman, Jr.
Available from the National Technical Information Service as PB-221 331, $6.50 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, Bulletin 58, May 1973. M.S. Thesis, 77 p, 1 fig, 16 tab, 80 ref. OWRR B-054-MINN (1). 14-31-0001-3601.

Descriptors: *Flood Plains, Management, *Non-Structural alternatives, *Minnesota, *Land-use, Flood data, Discount rates, *Flood protection, Flood plain insurance, *Cost analysis.
Identifiers: Indemnification programs, Casualty loss provisions, Beneficiaries, *Minnesota River basin.

Incidence of flood costs analysis provides justification for the imposition of land-use restrictions in flood plains in Minnesota. The analysis indicates that governmental units were the ultimate bearers of nearly half the flood costs in the Minnesota River Basin in the 1965 and 1969 floods. Government units have a substantial, justifiable interest in keeping flood costs down. Flood damage potential will continue to rise over time unless land use controls are instituted. Moreover, government costs are likely to make up an even larger proportion of flood costs in the future, with the advent of Federal flood insurance and an expanded Federal role in the provision of disaster relief. Therefore, thorough and vigorous enforcement of the 1969 Flood Plain Management Act is recommended. Whenever thorough economic analyses show them to be feasible, the alternatives of permanent evacuation or construction of local protection works ought to be considered these two alternatives are probably feasible in some areas. In areas where neither evacuation nor structural protection is economically feasible, land-use restrictions alone will have to suffice to curtail flood losses. The beneficiaries of structural flood control works ought to be assessed for a fair share of the costs of such works. This policy is not so crucial for existing flood plain developments, but is important for areas where new developments are permitted. (Walton-Minnesota)
W73-11055

REGIONAL WASTE WATER, SOLID WASTE DISPOSAL, WATER SUPPLY, AND STORM DRAINAGE SYSTEMS APPRAISAL.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-11252

TOWING ICEBERGS TO IRRIGATE ARID LANDS--MANNA OR MADNESS,
Cold Region Research and Engineering Lab., Hanover, N.H.
W. F. Weeks, and W. J. Campbell.
Science and Public Affairs, Bulletin of the Atomic Scientists, Vol 29, No 5, p 35-39, May 1973. 4 fig, 15 ref.

Descriptors: *Icebergs, *Water resources development, *Water transfer, *Water supply, Melt water, Water importing, Ice, Oceans, Ships, Methodology, Antarctic, Arctic.
Identifiers: *Iceberg towing.

Eighty-five percent of the world's available freshwater resides as ice in the Antarctic and Greenland. This water has generally been considered unavailable to portions of the world where large amounts of water could conceivably be utilized. Recent ideas for supplying large amounts of water in the form of ice to arid coastal areas in the Southern Hemisphere via the towing of icebergs are discussed. It is suggested that the idea appears both technologically feasible and economically attractive and merits serious consideration. (Woodard-USGS)
W73-11566

6G. Ecologic Impact of Water Development

ENVIRONMENTAL CONSERVATION,
R. F. Dasmann.
John Wiley and Sons, Inc.: New York, N.Y., London, England. 1972. 3rd Edition. 473 p, Illus, Maps. Pr $10.50.
Identifiers: Agriculture, Books, *Conservation, *Environmental studies, Foods, Livestock, Minerals, Soils, Wildlife.

This book is intended to provide a text for a 1-semester course concerned with man and his environment. Although a global view of conservation is presented, emphasis is on conservation problems of North America. The content begins with a discussion of the nature of the environment, the major biotic regions and man's record on the earth. Included are chapters on the conservation of the environment, soil, agriculture and world food supplies survey, civilization and water, forests and timber, livestock, wildlife management and the aquatic environment. The urban environment is described by discussions on the problem of population and the need for energy and for minerals. The final chapters describe the action for conservation which needs to be implemented and the vanishing wildlife and resources which necessarily follow environmental degradation. The conclusions contend our treatment of the environment determines our future. To guarantee a high quality of living and a wide range of human choice for the future action must begin immediately. Each chapter ends with a list of literature cited as well as with a list of general references on the subject discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-11170

QUALITATIVE VALUES IN ENVIRONMENTAL PLANNING: A STUDY OF RESOURCE USE IN URBANIZING WATERSHEDS,
Harvard Univ., Cambridge, Mass., Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W73-11253

ENVIRONMENTAL TERMINOLOGY INDEX.
Oak Ridge National Lab., Tenn. Environmental Information Systems Office.
For primary bibliographic entry see Field 10C.
W73-11387

THE FRESHWATER STREAM, A COMPLEX ECOSYSTEM,
Louisville Univ., Ky. Dept. of Biology.
L. A. Krumholz, and S. B. Neff.
Water Resources Bulletin, Vol 6, No 1, p 163-174, January-February 1970. 6 fig, 1 tab, 52 ref. OWRR B-005-KY (3).

Descriptors: *Ecosystems, *Streams, *Ecotypes, Environmental effects, Streamflow, Currents (Water), Channel morphology, Turbidity, Biological communities, Ecology, Water pollution, Environmental gradient, Speciation, Reviews, Evaluation.

The key to understanding the stream ecosystem is the unidirectional flow of the water mass it moves downhill. All water does not move toward the mouth at the same rate. Irregularities in the substrate cause a constant mixing and turbulence. Physical and chemical aspects of a stream ecosystem are generally favorable for aquatic life. The current and unidirectional flow exert a profound influence on those factors. Turbidity is influenced directly by current and, in turn, influences light penetration in the water. The amount and quality of light relates directly to photosynthesis in the stream and has a direct bearing on biological productivity. The numerous organisms and the variety of species that make up stream communities reflect their adaptations to the physical and chemical environment. Conducting an ecological survey of a stream ecosystem entails more than the preparation of a list of the species encountered. Sound information on the relative abundance of each species is required, and the ways in which the various species interact to keep the system going must be determined. (Woodard-USGS)
W73-11389

ENERGY VS. ENVIRONMENT,
B. C. Netschert.
Harvard Business Review, Vol 51, No 1, p 24-26, 28, 133-134, 138, 140, Jan-Feb 1973. 2 chart, 3 ref.

Descriptors: *Environmental effects, Energy, *Energy conversion, Energy transfer, *Pollution abatement, Consumption, Economics, Costs, Environment, Population, Electric power costs, Electric power production, Electric power demand, Efficiencies, Technology, Gasoline, Oil, Natural gas, Coal, Nuclear energy.
Identifiers: *Environmental quality, Living costs, Mass transit systems, Living standards, Environmental statements.

The production, conversion, and utilization of energy are responsible for many of today's environmental problems. Aggregate consumption of energy in the US has increased with population increases, but power consumption has outdistanced population growth, reflecting the general affluence of the people. The energy/environment conflict has already brought on supply difficulties and higher prices. Continued growth in energy demand can have but one effect, intensification of conflict and enlargement of the consequences. Higher prices for all are the general prospect which should create incentives to use energy more carefully, thus curtailing demand growth. Achieving greater efficiency in energy production and use should affect the energy growth rate. Technological developments now in the offing should resolve conflict of energy needs and pollution abatement. (USBR)
W73-11500

ECONOMIC GROWTH AND ENVIRONMENTAL IMPACT: EVALUATING ALTERNATIVES,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 06B.
W73-11511

PREIMPOUNDMENT STUDY, CARTERS LAKE.
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.

Available from NTIS, Springfield, Va 22151, as PB-213 307, Price $3.00 printed copy; $0.95 microfiche. Report, March 1972. 63 p, 9 fig, 8 tab, 5 ref, 5 append.

Descriptors: *Hydrologic data, *Pre-impoundment, *Reservoirs, *Georgia, Water analysis, Water quality, Forecasting, Recreation facilities, Water pollution sources, Thermal stratification, Environmental effects, Eutrophication.
Identifiers: *Carters Lake (Ga).

The Carters Lake (Georgia) preimpoundment study was conducted over a peiod of three years. With some local exceptions, the waters to be impounded for Carters Lake are of good quality. Secondary treatment and chlorination of municipal and industrial wastes from Ellijay, coupled with accelerated bacterial die-off associated with impoundment, should permit full use of Carters Lake as a desirable recreational area. Thermal stratification in this unusually deep reservoir will cause depressed dissolved oxygen levels and possible increases in dissolved iron and manganese in the hypolimnion. Downstream water quality (DO, iron, manganese, odors) could be adversely affected by hypolimnetic discharges. Effects of pumped storage on quality of release waters and reservoir stratification are not known in this specific case, but are expected to be beneficial. The current potential for occurrence of nuisance biological problems associated with reservoir eutrophication is low, but development of the watershed and reservoir periphery could increase the possibility of accelerated eutrophication. (Woodard-USGS)
W73-11530

07. RESOURCES DATA

7A. Network Design

WATER SAMPLING GUIDELINES AND INTERPRETATION OF DATA,
Environmental Health Lab., McClellan AFB, Calif.
R. V. Coyne, J. M. Campbell, and E. G. Robles, Jr.
Available from NTIS, Springfield, Va 22151 as AD-752 537 Price $3.00 printed copy; $0.95 microfiche. Professional Report No. 72M-5, March 1972. 51 p, 4 append.

Descriptors: *Water sampling, *Water analysis, *Chemical analysis, Methodology, Sampling, Preservation, Dissolved solids, Inorganic compounds, Surfactants, Turbidity.
Identifiers: *Water sampling guidelines.

A variety of aspects and associated problems of a water sampling program are discussed in an effort to make the data derived from that program more valid and more informative. Sampling data have meaning only where: (1) a water quality surveillance program is in force, (2) the objective of the sampling program is well defined, (3) samples are representative of the water source, (4) samples are preserved so as to maintain their quality until analyzed, and (5) the results of the analytical procedures are applied in conjunction with other pertinent data. A sample is no better than the poorest of those aspects. This does not mean that a random sample has no merit, but in most cases the objective of a sampling program is to allow a time differential comparison with other samples taken at the same location. Before this comparison can be valid, all the variables must be known and controlled. For this report, it is assumed that an adequate water quality surveillance program has been established and that the sampling stations have been selected. Based on that assumption, the mechanics of field data and sample collection, handling of the samples, and interpretation of the analytical report are discussed. (Woodard-USGS)
W73-11205

GEONATURAL RESOURCE PLANNING, PROPOSED GUIDELINES FOR A DETAILED GEONATURAL RESOURCE INVENTORY AND ANALYSIS REQUIRED TO UNDERTAKE A COMPREHENSIVE PLANNING AND DEVELOPMENT FOR ALBANY/DOUGHERTY COUNTY, GEORGIA,
Albany-Dougherty County Planning Commission, Albany, Ga.
S. J. Meltz.
February 1972. 20 p, 83 ref.

Descriptors: *Evaluation, *Natural resources, *Comprehensive planning, *Methodology, Regional development, Georgia, Data collections, Systems analysis, Optimum development plans.
Identifiers: Albany-Dougherty County (Georgia).

The future development of the Albany-Dougherty County, Georgia Metropolitan area will depend on an accurate assessment of the natural resources and environment of the region. Geonatural resources include all of the physical natural resources of the earth, such as air, water and land. A framework for evaluating these resources as they relate to future planning and development is outlined. The geonatural resources are identified as: (1) air, (2) water, (3) land, (4) minerals, (5) forest, and (6) marine. Resource problems include pollution, human needs of food, shelter and clothing, and human supportive capacity factors of population size, growth rate and population distribution. Many options exist for resource allocation or acquisition. Under land, for example, the land can be: (1) public, (2) private, (3) forest, (4) range, (5) estuary or wetlands, or (6) mined land. Tools are needed to conduct and implement the geonatural resource evaluation program, including accurate mapping and analysis of geographic, geologic, demographic, climatic, and ecologic factors. All information must be analyzed on the basis of the total system under consideration, consistent with program goals and objectives for the future development of the area. (Poertner)
W73-11672

7B. Data Acquisition

DIRECT DETERMINATION OF THE ELECTROMAGNETIC REFLECTION PROPERTIES OF SMOOTH BRACKISH WATER TO THE CONTINUOUS SPECTRUM FROM 100 MILLION TO 4 BILLION HERTZ,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 02L.
W73-11052

SPECTRA OF TURBULENT FLUCTUATIONS OVER OCEAN WAVES,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 02B.
W73-11087

PRINCIPLES OF LANDSLIDE IDENTIFICATION FROM AERIAL SURVEY DATA (PRINTSIPY RASPOZNAVANIYA OPOLZNEVYKH PROTSESSOV PO MATERIALAM AEROFOTOS'YEMKI),
Moscow State Univ. (USSR). Chair of Gemorphology.
For primary bibliographic entry see Field 02J.
W73-11100

UNSUPERVISED SPATIAL CLUSTERING WITH SPECTRAL DISCRIMINATION,
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.
For primary bibliographic entry see Field 07C.
W73-11116

A NEW METHOD FOR THE SOIL MOISTURE MEASUREMENT (MOMIN'S METHOD),
For primary bibliographic entry see Field 02G.
W73-11117

SURVEY OF APPLICATION OF RADIATION TO PREPARATIVE CHEMISTRY,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 02K.
W73-11119

REMOTE SENSING TECHNIQUES FOR DETECTING OIL SLICKS,
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-11137

A SMALL DIMENSION PROBE FOR THE DETERMINATION OF GROUND WATER FLOW DIRECTION,
Technical Univ., Lodz (Poland).
For primary bibliographic entry see Field 02F.
W73-11200

THE USE OF OCEAN TIDE RECORDS TO DETECT MOTIONS PREMONITORY TO A TECTONIC EVENT IN THE LONG BEACH, CALIFORNIA AREA,
Naval Postgraduate School, Monterey, Calif.
B. D. Wyman.
Available from NTIS, Springfield, Va. 22151, AD-753 596, Price $3.00 printed copy; $0.95 microfiche. M Sc Thesis, September 1972. 74 p, 17 fig, 9 tab, 44 ref.

Descriptors: *Tsunamis, *Ocean waves, *Waves (Water), *Earthquakes, Tides, Data collections, Computer programs, Methodology, Water levels, Correlation analysis, Meteorology, Ocean currents, *California.
Identifiers: Residual time series, Geological motions, Tectonic motions.

The goal was to extract the most powerful harmonic portions of the ocean tides and the meteorological effects from series of ocean tide level observations from several stations to generate residual time series reflecting geological and tectonic motions at the stations. Marigram records of ocean tide fluctuations at three tide stations operating in the Santa Monica/Long Beach, California, area at the time of the March 10, 1933, Long Beach earthquake (magnitude 6.3) were digitized onto magnetic tape. Time series of hourly instantaneous tide level observations were generated and processed under a least squares criterion to remove the effects of the nine most energetic lines of the ocean tide harmonic spectrum. The resulting residual series did not contain any anomalous premonitory motions indicated by another residual series previously analyzed at the National Center for Earthquake Research. Auto- and Cross-correlations of the three residual series used revealed only two possibly significant autocorrelation peaks for two stations lagging themselves by 24 hours. (Woodard-USGS)
W73-11214

AN EVALUATION OF THE UTILITY OF AVAILABLE REMOTE SENSOR RETURNS FOR A STUDY OF SLOPE FAILURE PHENOMENA,
East Tennessee State Univ., Johnson City. Dept. of Geology.
D. H. Poole.
Available from NTIS, Sprinfield, Va. 22151 as AD-750 735, Price $3.00 printed copy; $0.95 in microfiche. Remote Sensing Institute Technical Report 14, 1972. 36 p, 25 fig. ONR N00014-67-A-0102-0001.

Descriptors: *Slope stability, *Degradation (Slope), *Remote sensing, *Aerial photography, *North Carolina, Bank erosion, Photogrammetry, Cameras, Terrain analysis, Infrared radiation, Methodology, Correlation analysis, Photography, Aircraft.
Identifiers: Ektachrome, Ektachrome infrared, Panchromatic, Multi-spectral photography.

The utility of the photographs from NASA's North Carolina test site 46 for studying slope failure phenomena is evaluated. Slope failure forms depicted by the photography include both erosional and mass wastage forms. The imagery

made available to the investigator includes Ektachrome, Ektachrome infrared, panchromatic and multi-spectral nine-lens photography. The Ektachrome and Ektachrome infrared were available from each of the five missions conducted in the area of study. The multi-spectral nine-lens was available from two missions, and the panchromatic photography was available from a single mission. Of all the photographs made available the Ektachrome, Ektachrome infrared, and multispectral nine-lens afforded the most complete coverage. The usable portions of these photographs contained resoltuion and scale properties ranging from fair to good and registered satisfactory signatures of the whole range of slope failure forms under consideration. (Woodard-USGS)
W73-11216

METHOD AND APPARATUS FOR DETECTING THE HARDNESS LEVEL OF WATER,
Erie Mfg. Co., Milwaukee, Wis. (assignee)
R. K. Engholdt.
U. S. Patent No. 3,729,263, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 4, p 1322, April 24, 1973.

Descriptors: *Patents, *Water treatment, *Sampling, *Hardness (Water), *Water quality, *Water softening, Equipment.

A control for detecting the hardness level of water comprising a sampling means for periodically extracting a sample of water from the water system and mixing it with a reagent which is formulated to cause the sample to change color at a predetermined hardness level. The mixed sample is exposed to a detection device which includes a bridge circuit and a voltage-sensitive device connected to the bridge circuit for sensing an unbalanced condition in the bridge circuit. A pair of photo-conductive cells are connected in series in one leg of the bridge circuit. When the hardness of the samples is below a preselected level it will take on the color of the filter element (when mixed with the reagent) and the light falling on both cells will be of substantially the same color and intensity and thus the bridge circuit will remain in a balanced condition. When the sample is above the preselected hardness level it will assume a different color from that of the filter element. When this happens the color and intensity of the light falling on the two cells will be different causing the bridge circuit to become unbalanced. The voltage-sensitive means will sense the unbalanced condition and produce a signal which may be used for example to initiate the regeneration cycle of a water softener apparatus. (Sinha-OEIS)
W73-11227

LIQUID SAMPLING,
Pro-Tech, Inc., Malvern, Pa. (assignee).
M. D. Rutkowski, and R. K. Stanley.
U. S. Patent No 3,727,464, 6 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 859, April 17, 1973.

Descriptors: *Patents, Streams, Rivers, *Monitoring, Pollution abatement, *Water quality, Water analysis, *Water sampling, *Industrial wastes, *Treatment facilities.

Repetitive sampling of liquid from a body is controlled in frequency, dependent upon the depth of the liquid being sampled. Such depth-proportioning is accomplished using pressurized gas as a propulsion fluid and determining sampling frequency by gradual release of the gas to accumulate to a switching pressure at a given location through bleeding off part of the accumulating gas against the back pressure of the depth of liquid. (Sinha-OEIS)
W73-11235

AERIAL SURVEILLANCE SPILL PREVENTION SYSTEM,
McDonnell Aircraft Co., St. Louis, Mo. Reconnaissance Lab.
For primary bibliographic entry see Field 05B.
W73-11326

THE U.C.S. GRAIN-SIZE COMPARATOR DISC,
Unit of Coastal Sedimentation, Taunton (England).
R. Kirby.
Marine Geology, Vol 14, No 3, p M11-M14, March 1973. 2 fig, 2 ref.

Descriptors: *Particle size, *Measurement, *Instrumentation, Sedimentology, Sands, Silts, Clays, Estimating, Sampling, Bottom sediments.

A perspex disc produced for the purpose of measuring particle sizes in unconsolidated sediment samples in the field has eight segmented compartments containing standard samples ranging from granules to clay. The sample to be sized is placed over the clear perspex area of the disc and sized by visual comparison with the fractions in the segments. (Knapp-USGS)
W73-11395

THE INFERENCE OF ATMOSPHERIC OZONE USING SATELLITE NADIR MEASUREMENTS IN THE 1042/CM BAND,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
J. M. Russell, III, and S. R. Drayson.
Available from NTIS, Springfield, Va. 22151 NASA TR R-399 Price $3.00 printed copy; $0.95 microfiche. National Aeronautics and Space Administration Technical Report R-399, March 1973. 53 p, 20 fig, 7 tab, 64 ref.

Descriptors: *Atmosphere, *Ozone, *Remote sensing, *Infrared radiation, Measurement, Instrumentation, Satellites (Artificial), Boundary layers, Analytical techniques, Equations.
Identifiers: Infrared spectral region, Stratosphere, Troposphere.

A description and detailed analysis are presented of a technique for inferring atmospheric ozone information from satellite nadir measurements in the 1042/centimeter band. A method is formulated for computing the emission from the lower boundary under the satellite which circumvents the difficult analytical problems caused by the presence of atmospheric clouds and the water-vapor continuum absorption. The inversion equations are expanded in terms of the eigenvectors and eigenvalues of a least-squares-solution matrix, and an analysis is performed to determine the information content of the radiance measurements. Under favorable conditions there are only two pieces of independent information available from the measurements: the total ozone (u) and the altitude of the primary maximum in the ozone profile. An error analysis shows that errors in u are affected most by random radiance noise, lower boundary temperature errors, and ozone absorption-line intensity errors. Errors in altitude are affected most by the former two errors and also by temperature-profile bias errors. The results when all errors are considered simultaneously indicate that it should ultimately be possible to determine u to within 10% or less and to determine altitude to within 1.5 km when the root-mean-square radiance noise level is 1% or less. The calculations are also made for various degrees of cloudiness in the troposphere. The presence of clouds does not seriously affect results as long as there is some contrast between the ozone spectrum and the lower boundary emission spectrum. Finally, the inversion technique is applied to radiances measured from a balloon over Palestine, Texas, and to Nimbus III satellite data measured over the Bahama Islands. (Woodard-USGS)
W73-11400

PHOTOGRAPHIC WATER CONSERVATION AND RECLAMATION PROCESSES STUDY,
Eastman Kodak Co., Rochester, N.Y.
For primary bibliographic entry see Field 05A.
W73-11403

REMOTE SENSING EVALUATION OF ENVIRONMENTAL FACTORS AFFECTING THE DEVELOPMENTAL CAPACITY OF INLAND LAKES,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
S. J. G. Bird.
Available from NTIS, Springfield, Va 22151 as N 72-29298 Price $3.00 printed copy; $0.95 microfiche. Presented at the First Canadian Remote Sensing Symposium, February 9, 1972, Ottawa, Ontario, Canada, 1972. 19 p, 1 fig, 1 tab, 1 ref.

Descriptors: *Remote sensing, *Aerial photography, *Lakes, *Limnology, *Canada, Hydrologic aspects, Inflow, Discharge (Water), Lake morphology, Lake shores, Lake beds, Evaluation, Inland waterways.
Identifiers: Infrared color.

The multidisciplinary aspects of remote sensing are defined and applied to a specific investigation concerning the developmental capacity of the inland lakes of Ontario. The paper is presented in six sections: multidisciplinary aspects of remote sensing; purposes and phasing of lake capacity study; regional uses of remote sensing for lake capacity study; evaluation of parameters using remote sensors; specialized studies required in remote sensing; and conclusions and recommendations. High altitude photography would be extremely useful in establishing waterway connections, particularly infrared color which so reliably registers moisture content variations, thus confirming inflow and outlet points. (Woodard-USGS)
W73-11540

INVESTIGATION OF INFRARED ANOMALIES IN THE LAC DES DEUX MONTAGNES AREA, QUEBEC,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
P. A. Carr, and H. Gross.
Inland Waters Directorate Scientific Series No 19, 1972. 16 p, 5 fig, 2 tab, 11 ref.

Descriptors: *Remote sensing, *Groundwater movement, *Infrared radiation, *Surface-groundwater relationships, *St. Lawrence River, Canada, Surveys, Hydrogeology, Instrumentation, Water temperature.

In October 1965 infrared scanners were used in investigation of infrared anomalies related to groundwater discharge into the Ottawa River. On the basis of this survey, the Lac des Deux Montagnes area, on the Ottawa River just above its junction with the St. Lawrence River, was selected for more intensive study in 1968 and 1969. Comparison of imagery and published geological work led to the conclusion that no positive identification of groundwater discharge was made; however, it is possible that one anomaly, just southeast of Pointe Cavagnal, is caused by groundwater influx into the river along its bottom. (Knapp-USGS)
W73-11541

APPLICATION OF REMOTE SENSING TECHNIQUES TO MEASUREMENT OF USE OF OUTDOOR RECREATION RESOURCES,
Tennessee Univ., Knoxville. Dept. of Forestry.
K. F. Schell, and J. H. Taft.
Department of Interior Bureau of Outdoor Recreation Interagency Report USGS-256, September 1972. 110 p, 2 tab, 112 ref, 4 append. BOR Contract 2-14-02-1.

Descriptors: *Remote sensing, *Recreation, *Recreation facilities, Census, Planning, Methodology, Aerial photography, Aircraft, Radar, Evaluation, Costs.
Identifiers: *Dinade sensing system.

Remote sensing techniques were used to measure the number of individuals engaged in a specific outdoor recreation activity at a specific time. Airborne sensors received the most attention after initial study of satellite and high-altitude aircraft systems showed they offer no promise at this time for measuring recreation use. The DINADE-type system (similar to radar) probably has more potential than any other system encountered; however, the development costs for this single purpose could be prohibitive. Efforts to improve ground-based methods such as time-lapse or activated photography could be supply virtually constant monitoring. (Woodard-USGS)
W73-11546

APPLICATIONS OF MULTISPECTRAL REMOTE SENSING TECHNIQUES TO HYDROBIOLOGICAL INVESTIGATIONS IN EVERGLADES NATIONAL PARK,
Geological Survey, Tallahassee, Fla.
A. L. Higer, N. S. Thomson, F. J. Thomson, and M. C. Kolipinski.
Michigan University Willow Run Laboratories and U S Geological Survey joint report, Technical Report 2528-5-T, January 1970. 25 p, 7 fig, 2 tab, 4 ref. USGS Contract WRD-4012-632-69.

Descriptors: *Remote sensing, *Spectroscopy, *Hydrobiology, *Marshes, *Florida, Aquatic plants, Vegetation, Trees, Mapping, Analytical techniques, Aircraft, Soil-water-plant relationships, Management.
Identifiers: *Everglades National Park, *Multispectral imagery.

Multispectral data collection and processing techniques were used to map tree islands, emergent aquatic grassland vegetation, surface water of two different depths, and exposed limestone in a portion of the Everglades National Park in south Florida. Before multiband scanners, photographic techniques were the only practical way to inventory hydro-biological features in the park. Mapping with multiband-scanner data was tried here for the first time on a strip of park land 8 miles long and 2,000 ft wide, in September 1967. The recognition maps were produced by electronically processing selected combinations of video signals in the narrow spectral bands between 0.4 and 1.0 micrometers. The computer recognition maps were printed in different colors and superposed to provide a color-composite recognition map of the area. Periodic data collection and processing in this form would yield quantitative data concerning the direction and extent of plant successional changes. This in turn would provide more accurate information for water management practices in the park. (Woodard-USGS)
W73-11553

FALLING-DROP TECHNIQUE FOR SILT-CLAY SEDIMENT ANALYSIS,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 05A.
W73-11558

NATURAL RESOURCE INFORMATION SYSTEM REMOTE SENSING STUDIES,
Boeing Computer Services, Inc., Seattle, Wash.
J. Leachtenauer, R. Hirsch, V. Williams, and R. Tucker.
Available from NTIS Springfield, Va. 22151, as PB-211 384, Price $3.00 printed copy; $0.95 microfiche. Report, May 1972. 110 p, 9 fig, 14 tab, 89 ref, 1 append. BIA K51C14200459.

Descriptors: *Remote sensing, *Land management, *Water resources, *Aerial photography, Systems analysis, Input-output analysis, Forestry, Range management, Mapping, Soil types, Vegetation, Trees, Classification, Natural resources.

A major design objective of the Natural Resources Information System entailed the use of remote sensing data as an input to the system. A literature review was conducted to determine the types and qualities of imagery required to satisfy identified data needs. Ektachrome imagery available over the demonstration areas was reviewed to establish the feasibility of interpreting cultural features, range condition, water resources, and forestry. Using the same imagery, a land use map was prepared for the demonstration area. In the area of water resources and hydrology a great number of applications of remote sensing have been tested. These include studying drainage patterns where detailed map coverage is lacking; taking a census of water resource features, both natural and manmade, such as springs, wells, ponds, detentions, diversions, and canals; studying water quality in terms of industrial, mining or agricultural pollutants; and analyzing regional geomorphology in order to understand the groundwater and surface water regimes. A total of 22 studies covering hydrology applications were reviewed. (Woodard-USGS)
W73-11571

SYSTEM STUDY FOR SURVEILLANCE OF OCEAN DUMPING OPERATIONS.
Sperry Rand Corp., Great Neck, N.Y. Sperry Systems Management Div.
For primary bibliographic entry see Field 05B.
W73-11573

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO BUOY-BASED ENVIRONMENTAL DATA GATHERING,
National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
For primary bibliographic entry see Field 05A.
W73-11631

COMPREHENSIVE REGIONAL WATER AND SEWER INVENTORY AND ANALYSIS,
Alabama-Tombigbee Rivers Regional Planning and Development Commission, Camden.
S. J. Smyth.
Available from the National Technical Information Service as PB-211 482, $8.50 in paper copy, $0.95 in microfiche. June 1972. 123 p, 22 fig, 20 tab. ALA-TOM-72-02.

Descriptors: *Data collections, *Sewerage, *Water supply, Planning, Regional development, Evaluation, Alabama, Water distribution (Applied), Water works, Sewers, Sewerage disposal, Water quality, Water quantity, Analysis, Assessment.

A complete inventory and analysis of existing water and sewer facilities was made in the ten-county Alabama-Tombigbee Rivers Regional Planning and Development Commission area. This information will be used to form a comprehensive regional water and sewer plan. The region covers more than 9,600 square miles and had a 1970 population of 223,900. In general, the region has a rural, poor, agrarian society that has an abundance of human and natural resources. Most of the area is forest land and the timber industry is the largest part of the economy. A major obstacle in the preparation of this report was the lack of sufficient data, especially for the smaller communities and unincorporated areas. The water systems were examined from three main areas of concern: (1) quantity and quality of the water, (2) the treatment facility, and (3) the distribution system. A total of forty-four public and private systems, serving 40.8 percent of the area's population, derive their water from both ground and surface supplies. The sewerage system was examined in terms of the collection system and disposal facilities. There are eighteen public sewerage systems serving 30.6 percent of the area's population. (Poertner)
W73-11670

GEONATURAL RESOURCE PLANNING, PROPOSED GUIDELINES FOR A DETAILED GEONATURAL RESOURCE INVENTORY AND ANALYSIS REQUIRED TO UNDERTAKE A COMPREHENSIVE PLANNING AND DEVELOPMENT FOR ALBANY/DOUGHERTY COUNTY, GEORGIA,
Albany-Dougherty County Planning Commission, Albany, Ga.
For primary bibliographic entry see Field 07A.
W73-11672

7C. Evaluation, Processing and Publication

A CATALOG OF HYDROCLIMATOLOGICAL DATA FOR ALASKA'S COASTAL ZONE,
Alaska University, College. Inst. of Water Resources.
For primary bibliographic entry see Field 02B.
W73-11056

AN INVENTORY OF SUSPENDED SEDIMENT STATIONS AND TYPE OF DATA ANALYSIS FOR PENNSYLVANIA STREAMS, 1947-70,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 02J.
W73-11083

WATER RESOURCES DATA FOR ALABAMA, 1970: PART 2. WATER QUALITY RECORDS.
Geological Survey, University, Ala.
For primary bibliographic entry see Field 02K.
W73-11085

VIRGINIA SMALL STREAMS PROGRAM, PRELIMINARY FLOOD-FREQUENCY RELATIONS,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 02E.
W73-11090

GROUNDWATER DATA IN THE CORVALLIS--ALBANDY AREA, CENTRAL WILLIAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 04B.
W73-11093

FLOOD OF JUNE 9-10, 1972, AT RAPID CITY, SOUTH DAKOTA,
Geological Survey, Washington, D.C.
O. J. Larimer.
Available for sale by USGS, Washington, D. C. 20244, Price 75 cents. Hydrologic Investigations Atlas HA-511, 1973. 1 sheet, 7 fig, 1 map, 5 ref.

Descriptors: *Floods, *Flood data, *Flood damage, *Flood profiles, *South Dakota, Streamflow, Flow rates, Gaging stations, Flood peak, Peak discharge, Correlation analysis, Historic floods, Maps, Curves.
Identifiers: *Rapid City (S Dak).

This Atlas was prepared to describe the floods of June 9-10, 1972, in the immediate vicinity of Rapid City, South Dakota. The peak stage of 15.77 feet at the gaging station above Canyon Lake was 7.69 feet higher for the June 9-10, 1972, flood than the previous peak stage of record of May 23, 1952; the peak discharge of 31,200 cfs was 12 times that of

the flood of May 23, 1952, the previous maximum peak discharge in 26 years of record. At the gaging station in Rapid City, the peak of June 9-10, 1972, was 50,000 cfs, more than 15 times the previous maximum of 3,300 cfs on July 13, 1962. The stage of 15.45 feet was 7.08 feet higher than the previous peak of record on July 13, 1962. The extent of inundation from Rapid Creek in and around Rapid City is shown on a topographic base map. Inundation boundaries were identified from field inspections. The relation of the 50-year flood to drainage area for the Rapid City region is plotted. Also plotted are the peak discharges for the flood of June 9-10, 1972, at all points measured. These peaks exceed the 50-year discharge by several orders of magnitude. (Woodard-USGS)
W73-11105

GROUND WATER IN FINNEY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
E. D. Gutentag, D. H. Lobmeyer, H. E. McGovern, and W. A. Long.
For sale by U. S. Geological Survey, Washington, D.C. 20244, for $1.25 per set. Hydrologic Investigations Atlas HA-442, 1972. 3 sheets, 13 fig, 3 tab, 13 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water wells, *Water quality, *Kansas, Hydrologic data, Maps, Hydrographs, Water level fluctuations, Aquifer characteristics, Well data, Pumping, Water utilization, Water yield, Irrigation, Groundwater recharge, Chemical analysis.
Identifiers: *Finney County (Kans).

This 3-sheet hydrologic atlas describes groundwater conditions in Finney County, Kansas. Water in the Tertiary and Quaternary deposits ranges from a calcium bicarbonate type to a calcium sodium sulfate type, and generally is very hard. Water in the undifferentiated Lower Cretaceous rocks ranges from a sodium bicarbonate type to a sodium sulfate type. Areas are designated on a map with a summary table and geologic sections grouped according to similar hydrologic conditions that affect water quality in the Tertiary and Quaternary deposits. The geologic section shows the direction of groundwater movement as related to the changes in water quality. The concentrations of dissolved solids in the undifferentiated Upper Jurassic and Lower Cretaceous rocks increase from less than 300 mg/liter to more than 2,500 mg/liter as the depth and distance from the area of recharge increase. The increasing utilization of groundwater for irrigation has resulted in a decline in water levels with an accompanying loss of water from storage. Water-level declines from 1940 to 1968 range from less than 10 to more than 40 feet. (Woodard-USGS)
W73-11106

UNSUPERVISED SPATIAL CLUSTERING WITH SPECTRAL DISCRIMINATION,
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.
R. R. Jayroe, Jr.
Available from NTIS, Springfield, Va 22151 as NASA TN D-7312, Price $3.00 printed copy; $0.95 microfiche. Technical Note TN D-7312, May 1973. 85 p, 28 fig, 10 tab, 25 ref.

Descriptors: *Data processing, *Natural resources, *Remote sensing, *Satellites (Artificial), *Computer programs, Methodology, Classification, Equations.
Identifiers: *Earth resources, Clustering.

The recent development of manned and unmanned space vehicles has brought about an almost unprecedented advance in studies of remotely sensed earth observations. These observations require a multidisciplinary study which includes such fields as agriculture, forestry, geography, demography, cartography, geology, meteorology, hydrology, oceanography, environmental quality, ecology, sensor technology, and interpretation techniques development. With this advance comes an unprecedented amount of data. The problem arises of how to analyze and extract information from such large volumes of data in an efficient manner. The main emphasis of this work is the development of a computer program for extracting features from remotely sensed data presented in digital image form. This computer program requires no human supervision or prejudgement and operates unassisted on the raw digital data. Also included are a condensed general background on remote sensing of earth features and a short synopsis on some of the most commonly used types of feature extraction techniques. This discussion is followed by a presentation of results obtained from the unsupervised feature extraction computer program along with a description and listing of the computer program. (Woodard-USGS)
W73-11116

GROUNDWATER LEVELS IN NEBRASKA, 1972,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 04B.
W73-11120

RELATIONSHIPS BETWEEN SATURATED HYDRAULIC CONDUCTIVITY AND MORPHOMETRIC DATA OF AN ARGILLIC HORIZON,
Wisconsin Geological and Natural History Survey, Madison.
For primary bibliographic entry see Field 02G.
W73-11211

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS, METROPOLITAN AREA, 1971,
Geological Survey, Fort Worth, Tex.
For primary bibliographic entry see Field 04C.
W73-11215

FREEZE-FREE (32 F) SEASONS OF THE MAJOR BASINS AND PLATEAUS OF NEVADA,
National Weather Service, Reno, Nev. Weather Service Office.
C. M. Sakamoto, F. F. Peterson, E. A. Naphan, H. P. Cords, and H. R. Guenthner.
Nevada State Engineers Office, Carson City, Division of Water Resources Map S-14, 1973. 1 sheet, 1 map, 4 tab, 2 ref.

Descriptors: *Horticultural crops, *Agriculture, *Temperature, *Nevada, *Crop production, Climate zones, Maps, Land use, Topography, Vegetation, Soil-water-plant relationships.
Identifiers: Freeze-free seasons (Nev).

This map (scale 1:750,000) shows the freeze-free (32 deg F) seasons of the level to rolling basins and plateaus of Nevada. These are the areas of greatest potential for agricultural or urban development. The major crops adapted to Nevada's different freeze-free zones are listed to indicate the agricultural potential of lands in the zones. Hydrographic areas used for state-wide water management are shown as part of the base maps. Five classes of freeze-free season length, or zones, are given. Zone 1 includes areas of more than 200 days' freeze-free season; zone 2 includes areas of 130- to 200-day season; zone 3 includes areas of 100- to 130-day season; zone 4 includes areas 70- to 100-day season and zone 5 includes those areas of less than 70-day freeze free season. These season lengths give useful predictions of crop adaptability based on current knowledge of Nevada's climate and crops. Freeze-free seasons are shorter in northern than southern Nevada, and also are shorter for basins at higher elevations at the same latitude. The longest seasons are in the low basins of southern Nevada, whereas the shortest seasons are in the high basins of east-central Nevada and across its northern basins and plateaus. The extent of each zone, and other geographic attributes, are shown. (Woodard-USGS)
W73-11218

BATHYMETRIC RECONNAISSANCE OF WILD HORSE RESERVOIR, ELKO COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
T. L. Katzer, and L. Harmsen.
Nevada Division of Water Resources, Carson City, Water Resources Information Series Report-16, 1973. 1 sheet, 5 fig, 1 map, 2 tab, 1 ref.

Descriptors: *Limnology, *Reservoirs, *Bathymetry, *Nevada, Sedimentation, Water quality, Streamflow, Inflow, Discharge (Water), Chemical analysis, Evaporation, Hydrologic data, Maps, Curves, Sedimentation, Water temperature.

Wild Horse Reservoir is in Elko County, Nevada, on the northeastern flank of the Independence Mountains, about 62 miles north of Elko and 12 miles southeast of Mountain City, on State Route 51. The drainage area of the Owyhee River (the main tributary to Wild Horse Reservoir) at the gaging station immediately below the reservoir is about 209 square miles. The reservoir is operated to provide irrigation water for about 21,000 acres of Indian land. A continuous recording, electronic fathometer was used to measure the depth of the reservoir on 48 traverses. The bathymetric survey was made on May 25-26, 1972, when the reservoir was spilling at stage, 6,205.6 feet. At spillway elevation, 6,205 feet, the water-surface area is 2,830 acres and the storage capacity is 73,500 acre-feet. There has been no identifiable loss of storage due to sedimentation, and therefore, sediment transport into Wild Horse Reservoir is assumed to have been minor. Water-quality data are tabulated for the sampling site downstream from Wild Horse Reservoir. (Woodard-USGS)
W73-11219

BATHYMETRIC RECONNAISSANCE OF WEBER RESERVOIR, MINERAL COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
T. L. Katzer, and L. Harmsen.
Nevada Division of Water Resources, Water Resources Information Series Report-15, 1973. 1 sheet, 5 fig, 1 map, 3 tab, 2 ref.

Descriptors: *Limnology, *Reservoirs, *Bathymetry, *Nevada, Sedimentation, Water quality, Water temperature, Chemical analysis, Maps, Curves, Streamflow, Inflow, Discharge (Water), Hydrologic data.

A continuously recording, electric fathometer was used to measure the depth of the Weber reservoir in Mineral County, Nevada, on 38 traverses. The reservoir was at maximum operating stage, 4,208.0 feet (considered full with 2 feet of freeboard left on radial spillway gates) during the survey on May 22-23, 1972. The stage-area-capacity figures indicate a water-surface area of 900 acres and a storage capacity of 10,700 acre-feet at stage 4,208 feet, or about 2,400 acre-feet less storage capacity than the original area-capacity figures. This represents an 18% loss of computed storage capacity. The maximum reservoir depth was 29 feet. An increase of sediment concentration was evident with depth of water, and more sediment moving into the reservoir (236 mg/liter) than was moving out (82 mg/liter). Chemical analyses of water samples collected druing the 1971 water year at the Walker River gaging station near Wabuska are tabulated. Vertical temperature profiles taken on May 23, 1972, at two sites in the reservoir are shown. The water-inflow temperature at the head

of the reservoir at that time was 21 deg C; the outflow temperature, taken as water was being released from the bottom of the reservoir, was 14.5 deg C. (Woodard-USGS)
W73-11220

STREAM DEPLETION FACTORS, ARKANSAS RIVER VALLEY, SOUTHEASTERN COLORADO: A BASIS FOR EVALUATING PLANS FOR CONJUNCTIVE USE OF GROUND AND SURFACE WATER,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-11221

WATER RESOURCES OF HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-11222

URBANIZATION'S DRAINAGE CONSEQUENCE,
Nolte (George S.) and Associates, San Jose, Calif.; and San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 04C.
W73-11254

GENERIC FEED FORWARD CONTROL OF ACTIVATED SLUDGE,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05D.
W73-11362

RIVER SYSTEMS TRANSITION FUNCTION AND OPERATION STUDY,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Resources Planning.
For primary bibliographic entry see Field 04A.
W73-11364

PROBABILISTIC SHORT-TERM RIVER YIELD FORECASTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-11366

WATER RECORDS OF THE U.S. VIRGIN ISLANDS, 1962-69,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W73-11396

GROUND-WATER BASIC DATA OF CAVALIER AND PEMBINA COUNTIES,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 04B.
W73-11397

LOCATION AND DETERMINATION OF DEPTHS OF SUBSURFACE UNDULATIONS BY SEISMIC METHODS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08E.
W73-11398

HYDROLOGIC RECORDS FOR VOLUSIA COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
C. P. Laughlin, and D. M. Hughes.
Open-file report 72030, 1973. 51 p, 32 fig, 8 tab, 4 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Hydrologic data, *Florida, Basic data collections, Aquifers, Water wells, Water level fluctuations, Streamflow, Flow rates, Rainfall, Water yield, Water quality, Chemical analysis, Dissolved solids, Nutrients.
Identifiers: *Volusia County (Fla).

Volusia County, Fla., an area of 1,200 square miles, is in the central part of eastern coastal Florida. In 1970 the population of the county was 170,000, and increase of 35% over 1960. The population growth is reflected in increased demands on the county's water resource. In 1966 the U.S. Geological Survey began a program of hydrologic records collection for Volusia County in cooperation with the Board of County Commissioners of Volusia County through the Bureau of Geology, Florida Department of Natural Resources. Water quality and quantity are monitored at surface and groundwater data sites where previous comprehensive studies have indicated that such records are necessary for continuing management of the county's water resource. Hydrologic conditions in Volusia County are presented in tabular and graphic form. Data on wells, springs, and lakes are for May 1971 to May 1972; data on streams are for the 1971 water year, October 1, 1970 to September 30, 1971. In addition, data are included for two surface-water stations maintained in cooperation with the Florida Department of Transportation, for one surface-water station maintained in cooperation with the U.S. Army Corps of Engineers, and for several stations maintained in cooperation with the Florida Bureau of Geology. (Woodard-USGS)
W73-11399

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1972,
Geological Survey, Honolulu, Hawaii. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-11404

MATHEMATICAL METHODS IN THE THEORY AND PRACTICE OF MOUNTAIN STREAMFLOW COMPUTATION AND FORECASTING (MATEMATICHESKIYE METODY V TEORII I PRAKTIKE RASCHETOV I PROGNOZOV STOKA GORNYKH REK).
Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).
For primary bibliographic entry see Field 04A.
W73-11406

WATER REQUIREMENTS FOR OPTIMUM CROP YIELD,
Corps of Engineers, West Palm Beach, Fla.
For primary bibliographic entry see Field 03F.
W73-11507

AN INDIVIDUAL APPROACH TO INDEPENDENT COMPUTER SURVEY,
Engineering Surveys Ltd., Weybridge (England).
W. F. Johnston, and G. L. Thornton.
Surv Mapp, Vol 32, No 4, p 479-489, Dec 1972. 3 fig.

Descriptors: Digital computers, *Topographic mapping, Data processing, *Contours, Computer programs, Cross-sections, Mapping, Numerical analysis, Measurement, Volume, Earthworks, Foreign research, *Surveys, Geologic mapping.
Identifiers: *Plotting, Great Britain, *Plotters.

Planning and development of a computer system is described that produces a digital terrain model (DTM) from a series of random points based on field data. The model is used as a data base for the computer to automatically: (1) plot contours at any desired intervals for topographic maps; (2) produce cross sections and longitudinal sections of existing roads; and (3) compute earthwork quantities. The model consists mainly of a series of points of known elevations and locations. The model is computed from measured points representing the surface. This enables the surveyor to follow normal practices without artificial constrictions. The model is computed in a square grid, the cell size being optimized from the density and distribution of the measured data. Selection and details of the computer hardware and the problems of training computer operators are discussed. Other applications of DTM are: (1) designing new airfields; (2) computing volumes on a routine and regular basis either to control excavations or filling at open pit mines; (3) measuring stockpiles; (4) port development, and (5) geological mapping (USBR).
W73-11512

NUMERICAL STATISTICS IN ENGINEERING GEOLOGY,
McGill Univ., Montreal (Quebec).
For primary bibliographic entry see Field 08G.
W73-11517

COMPUTER PROGRAM SYSTEM FOR AEROTRIANGULATION,
Illinois Univ., Urbana.
K. W. Wong, and G. Elphingstone.
J Surv Mapp Div, Am Soc Civ Eng, Vol 98, No. SU2, p 219-231, Nov 1972. 6 fig, 5 tab, 4 ref, 2 append.

Descriptors: *Aerial photography, *Photogrammetry, *Computer programs, Mapping, Altitude, Evaluation, Control, Distance.
Identifiers: *Surveying, Triangulation nets, Position finding, Azimuth, *Aerotriangulation, Geodetic surveys, Geodesy.

A total system of highly flexible computer programs developed to meet all computation needs in analytic aerotriangulation is presented. The basic solution is based on simultaneous adjustment of all photogrammetric and geodetic observations. This solution, SAPGO, provides a more rigorous solution for aerotriangulation than the conventional simultaneous solution. All fundamental measurements, such as image coordinates, horizontal angles, distances, and elevations, can be weighted according to the accuracy with which these measurements were made. Independent geodetic measurements may also be used to control aerotriangulation projects over poorly accessible terrains. The component concept has been used to provide several versions of the SAPGO programs so that surveying and mapping engineers, who have little knowledge of the theory of analytical photogrammetry can use them. Several program packages developed are: (1) for processing of small triangulation projects (less than 40 photos), (2) handling unlimited size blocks, and (3) simulation studies. Tests using fictitious data showed that the solution method is accurate and sensitive to variations in weights. (USBR)
W73-11518

RESERVOIR BANK STORAGE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02H.
W73-11542

SUPPLEMENTATION OF MISSING VALUES IN WATER QUALITY DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05G.
W73-11687

08. ENGINEERING WORKS

8A. Structures

MOBILE AREA WATER TRANSPORTATION STUDY OF MOBILE, BALDWIN AND ESCAMBIA COUNTIES, ALABAMA.
Tippetts Abbett McCarthy Stratton, New York.

South Alabama Regional Planning Commission, Mobile, December, 1968. 161 p, 8 fig, 8 maps, 55 tab. HUD Alabama P-32.

Descriptors: *Harbors, *Navigation, *Transportation, Water resources development, Planning, Channel improvement, *Alabama.
Identifiers: *Mobile, *Baldwin County (Ala), *Escambia County (Ala), Economic growth, Industrial development, Waterfronts, Port facilities.

The development of the port of Mobile and the surrounding waterways is seen as an important means to encourage economic growth in southern Alabama. The area's resources can be used for transportation arteries and sources of industrial water supply as well as for recreation and commercial fishing. This program for the phased development of the navigable waters in the Mobile area focuses on two basic issues: the demand of industries for port facilities and waterfront locations and the need for expansion and improvement of the port of Mobile. These issues are dealt with in eight chapters analyzing the existing port economy, inventorying port facilities, forecasting industrial development and water traffic, assessing the need for waterfront land sites, and identifying a three-stage development program. The development program proposes locations for various types of industries and marine facilities and the time of several channel improvements and terminals. (Elfers-North Carolina)
W73-11260

CONTROL OF HAZARDOUS CHEMICAL SPILLS BY PHYSICAL BARRIERS,
MSA Research Corp., Evans City, Pa.
For primary bibliographic entry see Field 05G.
W73-11338

LEAST COST METHOD FOR SEWER DESIGN,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 05G.
W73-11360

TYPICAL LOG-CURVE SHAPES INDICATE FORMATION CHARACTERISTICS,
Dresser Industries, Inc., Houston, Tex.
W. R. Matthews.
Oil and Gas Journal, Vol 69, No 49, p 66-72, December 6, 1971.

Descriptors: Logging (Recording), *Electrical well logging, Resistivity, Gamma rays, *Lithologic logs, Sandstone, Shales, Salinity wells, Drilling, Density.
Identifiers: *Spontaneous potential, Rock salt.

A look at log curve shapes, or trends, is a good place to begin the study of formation identification. The SP portion of the electric log can be used for: distinguishing sands from shales, for determining water salinity in sand, prediction of oil, gas, or water production from a sand, and estimation of mud-weight requirements. The method of establishing shale and sand lines is discussed. Methods of determining shale values-averages of 10 to 50 feet intervals, and maximum values, are shown. Each technique has advantages and disadvantages. Other types of logs discussed which are useful in formation evaluation are the density log, the gamma-ray log, and the resistivity and conductivity logs. In the identification of rock salt, the density log is especially useful as the bulk density of salt is usually below 2.0 g/cc. Oil muds affect the resistivity and conductivity values on a resistivity-type log. (Smith-NWWA)
W73-11456

HOW TO CUT DRILLING COSTS BY REDUCING NONDRILLING TIME,
Field Drilling Co., San Antonio, Tex.
J. P. Kidd.
Oil and Gas Journal, Vol 70, No 36, p 91-93, September 4, 1972. 1 fig.

Descriptors: Drilling, *Drilling equipment, Costs, *Cost analysis, Cost comparisons, Oil industry, Wells, Boreholes, Well casing, Drill holes, *Efficiencies, Repairing.
Identifiers: Drill rigs, Trip time, Contracting.

Virtually all efforts of drilling technologists have to date gone into maximizing the feet drilled per hour and the hours drilled per bit, while minimizing the number of bits and the total rotating hours. It is pointed out, however, that it is generally easier and cheaper to save additional rig time by giving special attention to making connections, handling drill collars, tripping, and other nondrilling operations. Assuming it takes 200 days to drill and complete a large midcontinent well, total well costs excluding permanent well equipment would run $4,000/day or higher. So, the cost of losing only 1 minute each hour could total $13,300 during the drilling of one well. Key areas in reducing costs by improving nondrilling operations include time required for connections, trips, setting surface casing and waiting on cement, deviation surveys, and rig service. (Smith-NWWA)
W73-11460

DIAMOND BITS CORE SAMPLES OF NEW YORK ROADS.

Public Works, Vol 99, No 5, p 93-94, May 1968. 3 fig.

Descriptors: Drilling, *Drilling equipment, Drilling samples, Concretes, *Concrete structures, Asphalt, Cores, *Core drilling, New York, Paving, Highways.
Identifiers: *Diamond drilling, Bits.

In sixty to ninety seconds, a core 9 inches in length and 4 or 6 inches in diameter is drilled from reinforced portland cement concrete by means of diamond bits; 5000 per year are drilled from new construction in New York. Shot drilling, used before the switch to diamond drilling, took much more time. Ten completely self-contained two-wheeled trailer-mounted machines were built to order, each having a swivel-type drill head capable of swinging 360 deg for horizontal, angle and overhead drilling. Average operating speed is 1200 rpm. Each of the carefully trained two-man drill crews is required to keep a record on each diamond bit by number of cores drilled; number of inches per core; and type of material sampled. The effective life of the average diamond bit is about 900 inches in Portland cement concrete and about twice as much in asphalt. The most skillful drillers obtain as much as 2,500 or 3,000 inches per bit. Production of cores with diamond drilling over the old shot drilling method has increased about fourfold. (Campbell-NWWA)
W73-11461

WET WELL WOES,
Saint Petersburg Beach City Engineers, Fla.
A. V. Sedrick.
Public Works, Vol 99, No 8, p 98-99, August 1968. 3 fig.

Descriptors: Concretes, Concrete construction, Concrete finishing, *Concrete structures, Acids, Florida, Sewers, Sewerage, Materials, Corrosion, *Repairing, Mortar, *Corrosion control, *Deterioration.
Identifiers: Wet wells, Sandblasting.

Sewer gases producing corrosive acids had severely deteriorated the concrete surfaces in wet wells of the St. Petersburg Beach, Florida sewer system. In some cases the reinforcing steel was fully exposed. Various materials used for repair had in most cases proved unsatisfactory. Some would lose their bonding effect in less than six months, while others reacted to the corrosive atmosphere within two years. The latest resurfacing material, a micro-cement, has promising indications of the desired properties for permanent repair at reasonable cost. Installation involved shutting off the system in the section to be repaired, sandblasting all deteriorated surfaces, removing loose, contaminated concrete, flushing all surfaces with clean water, and applying the mortar material to the prepared surfaces. The material set very quickly; six weeks after application, inspection revealed no hairline or shrinkage cracks even in areas which needed substantial build-up. (Smith-NWWA)
W73-11462

ABNORMAL PRESSURES IN DEEP WELLS OF SOUTHWESTERN LOUISIANA,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 08E.
W73-11464

OIL FIELD TECHNIQUES USED TO INCREASE FLOW IN COMMUNITY WATER WELL,
T. J. Barnhart.
Water Well Journal, Vol 21, No 1, p 24, January 1966.

Descriptors: Wells, *Water wells, Hydraulics, Limestones, Aquifer management, *Water yield improvement, Groundwater, Groundwater availability, Boreholes, *Hydraulic machinery.
Identifiers: Well development, *Well stimulation, *Hydraulic fracturing, Packers (Borehole), Acidizing (Wells).

Hydraulic fracturing is a method used in oil and gas wells to increase rate of production. Various combinations of fluids and propping sands are injected into the producing zone at sufficient pressure to fracture or break the formation down. The sand acts as a propping agent for the fractures which serve as zones of higher conductivity for the produced fluids. In the example given, a well's yield was increased from 22 to 110 gpm using gelled fresh water and sand to fracture the producing zone. A packer was used to divert the fracturing fluids to the desired portion of the open hole at approximately 205 feet in the Niagara Lime aquifer. 600 psi was necessary to break the formation down; additional fluid was pumped into the formation at 400 psi. The packer was then unseated and moved uphole approximately 20 feet where the same procedure was followed. (Campbell-NWWA)
W73-11465

OBSERVATION BOREHOLES--CONSTRUCTION AND USE: FINAL REPORT OF RESEARCH PANEL, NO. 9.
Institution of Water Engineers, London (England).

Institution of Water Engineers Journal, Vol 23, No 6, p 369-381, June 1969. 3 tab.

Descriptors: Wells, Water wells, *Observation wells, Construction, Construction costs, *Boreholes, *Aquifer characteristics, Rock properties, Sampling, *Water sampling, Water supply development, Transmissivity, Storage coefficient, Porosity, Permeability.

Identifiers: Strata (Geologic), *Observation boreholes.

An observation borehole is a boring, generally of small diameter, which is drilled into underground strata to penetrate either partially or fully an aquifer or aquifers and thereby provide a means of measuring the physical and chemical properties of the ground water and the physical characteristics of the aquifer. Water level measurement, water sampling for analysis, rock sampling, and other hydrogeological parameters measured by borehole logging are discussed. The diameter and depth of observation boreholes depend on various factors which are listed. Construction methods used to drill boreholes and the costs of each are explained, including auger, jetting, percussion, and both forward and reverse circulation rotary methods. Standardization of materials, fittings, recorders, and headworks for boreholes is recommended both to ensure high quality of construction and to minimize their cost. (Smith-NWWA)
W73-11466

OPTIMUM HOLE DIAMETER FOR WATER WELLS,
R. R. Aitkin, and E. L. Alexander.
Water Well Journal, Vol 21, No 1, p 18-19, 22, 65, January 1967. 3 fig.

Descriptors: Wells, Water wells, *Optimization, Well casings, Well screens, *Pump testing, *Economics, Aquifers, Drawdown, Aquifer testing, Water supply development, Storage coefficient, Water levels.
Identifiers: *Well diameters.

A logical approach to the determination of optimum hole diameter for a water well must start with a hydrogeological study to ascertain: (1) the quantity and quality of water available at a given site where the need for water exists; (2) the location of a site that will yield water of sufficient quantity and quality to satisfy an anticipated need. A meaningful accumulation of data for the proper evaluation of a given area in terms of water resource development should include weather, drainage, slope of rock bed, formation names, description of materials, and hydrologic information. In determining optimum hole diameter, the importance of a properly conducted aquifer test is stressed. Common procedure is to pump the well at a constant rate while measuring the water level in the pumping well, and if possible, in at least two observation holes. In determining well size, a decision must be made as to the diameter of casing required to accommodate the air line tubes, special water level measuring devices and the pump that will produce the needed quantity of water. (Smith-NWWA)
W73-11468

CATHODIC PROTECTION--THEORY AND PRACTICE IN THE WATER INDUSTRY,
Corrosion Engineers Ltd., Alresford, (England).
K. G. C. Berkeley.
Water and Water Engineering, Vol 72, No 872, p 416-422, October, 1968. 8 fig, 3 tab, 7 ref.

Descriptors: Corrosion, Corrosion control, *Cathodic protection, Electrochemistry, Anodes, Magnesium, Electric currents, *Design criteria, Acidity, Alkaline soils, Acid soils, Soil properties.
Identifiers: *Galvanic corrosion, Electrical circuits.

The history, causes and the remedial approach to some of the corrosion problems affecting the water industry are outlined. Phenomena leading to electrochemical corrosion are described, and the extent to which cathodic protection can be utilized by those having responsibility for planning and design is indicated, in order to enable those responsible to ascertain at what stage action should be taken. The four basic causes of metallic deterioration--galvanic corrosion, differential aeration, stray current corrosion, and bacterial corrosion--are briefly discussed. Cathodic protection is not an absolute solution but one which can be extremely successful. The overall cost of protection must obviously vary, but a reasonable figure is some 0.5 to 5 per cent of the cost of a structure covering a 20 year life. (Smith-NWWA)
W73-11472

ESTIMATING WELL COSTS.

Industrial Water Engineering, Vol 7, No 4, p 30-32, April, 1970. 4 fig, 1 tab.

Descriptors: Wells, *Water wells, *Cost analysis, Shallow wells, Well screens, Well casings, Pumps, Unconsolidated aquifers, Aquifers, Boreholes, Materials, *Cost comparisons, *Graphical analysis.
Identifiers: Well yield, Well diameter.

Well-cost data were divided into three categories, namely sand and gravel wells, shallow bedrock wells, and deep sandstone wells. Naturally-developed and artificially gravel-packed wells finished in sand and gravel were considered separately. Wells tapping Pennsylvanian, Mississippian and Devonian sandstone or limestone, and those tapping the Silurian or upper Ordovician dolomite aquifers were combined in the shallow bedrock grouping. Those wells penetrating the Cambrian-Ordovician or Mount Simon rocks were considered as deep sandstone wells. Analysis of data, taken from an Illinois State Water Survey Circular, showed that the cost of wells is directly related to depth. Further studies showed that wells are generally constructed of a given diameter in order to provide sufficient minimum clearance for a pump with a specified capacity equal to the desired yield of the well. In recent years there has been a trend toward using casing at least two nominal diameters larger than than the minimum required to allow installation of the pump. (Smith-NWWA)
W73-11476

THE BIGGEST ARTESIAN WELL IN THE WORLD,
Artesia Chamber of Commerce, N. Mex.
B. Koonce.
The Farm Quarterly, Vol 20, No 2, p 60, 98, 99, Summer 1965. 3 fig.

Descriptors: Wells, *Water wells, Limestones, Drilling, Carbonates, Aquifers, Artesian aquifers, *Artesian wells, Well casing, Valves, New Mexico, *Irrigation wells, Clays, Grouting.
Identifiers: Abandonment (Wells), *Plugging (Wells).

Details of the drilling of a record artesian well, 840 feet deep with a yield of 9,280 gpm are given. Named the Great Oasis Well, it is located near Roswell, New Mexico, and was drilled in 1931 on the property of J. H. Gifford by Myron Bruning. Near the proposed well site was an old eight inch well which had run an uncontrolled stream for years. Using dense native red clay and cottonseed hulls, Bruning made a mixture which, when pumped into the well bore, shut the flow of water off and sealed the well. Then attention was turned to drilling the big well. 710 feet of 18 inch hole was drilled into which a 13 inch casing was set and grouted in with the red clay mixture. A 12 inch bit was let down and drilled through the San Andres limestone to the total depth of 840 feet. Sixty feet of 13 inch well casing was attached to a gate valve and hoisted onto the well head; the casing was detached from the wellhead and the gate valve closed. For display purposes, a reducer which held the outlet to four inches was attached, spraying the water 75 feet into the air. (Smith-NWWA)
W73-11481

A PROBABILISTIC APPROACH TO MAXIMUM COLUMN STRENGTH,
Lehigh Univ., Bethlehem, Pa.
R. Bjorhovde.
Paper, American Society of Civil Engineers, Spec Conf Safety Reliab Metal Struct, Pittsburgh, Pa, Nov 1972. 30 p, 9 fig, 16 ref.

Descriptors: *Columns, Deflection, *Structural analysis, *Structural behavior, Structural members, Structural shapes, Structural design, *Probability theory, Performance, Steel, Investigations, Compressive strength, Loads (Forces), Bibliographies.
Identifiers: *Camber, Deterministic model, Supports, Vertical loads, Flexural strength, Residual stress, Statistical analysis.

A probabilistic method is presented for determining maximum strength of centrally loaded, initially curved, pinned-end, prismatic steel columns. In calculating maximum strength, the variation of relevant strength parameters is considered explicitly. This method circumvents several of the steps necessary in the familiar deterministic approach, and permits direct analysis of separate and joint effects of the variables. A structure exhibiting a random nonlinear behavior, for which the basic relationships are expressed as incremental, iterative equations, is treated within the context of probability theory. Random variation of the strength of a particular column depends on the random variation of the initial out-of-straightness. Random variation of the yield stress has a small effect on the column strength but increase with increasing yield stress and range of variation. Random variation of the residual stresses about their mean, and of cross-sectional properties, do not contribute significantly to random variation of maximum column strength. A brief description of the deterministic method for analysis of maximum column strength is also given. (USBR)
W73-11516

DESIGNING TO PREVENT BRITTLE FRACTURES IN BRIDGES,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 08G.
W73-11525

DETERMINING THE STRENGTH OF CORRODED PIPE,
Texas Eastern Transmission Corp., Shreveport, La.
For primary bibliographic entry see Field 08G.
W73-11527

HYDRAULIC DESIGN OF STILLING BASIN FOR PIPE OR CHANNEL OUTLETS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08B.
W73-11533

STUDY FOR IMPROVEMENT OF MONTE SANO BAYOU FROM AIRLINE HIGHWAY TO MISSISSIPPI RIVER EAST BRANCH ROUGE PARISH, LOUISIANA.
Brown and Butler, Baton Rouge, La.

Mayor and Council City of Baton Rouge and Parish of East Baton Rouge, Louisiana, May 1969. 82 p, 49 fig, 2 tab.

Descriptors: *Flood control, *Channel improvement, *Hydraulic structures, Hydraulics, Culverts, Head loss, Design flow, Louisiana, Channel flow, Canal linings, Concrete-lined canals.
Identifiers: *Monte Sano Bayou (Louisiana).

Improvement of the Monte Sano Bayou in the parish of East Baton Rouge, Louisiana was studied to control flooding problems. The watershed

covers about 6,750 acres, and is primarily industrial but also contains heavily populated urban areas and agricultural lands. Design criteria were specified for the project, including a stage elevation of 36.5 at the Mississippi River outlet and a maximum elevation of 47.0 at Airline Highway, approximately 6,000 feet upstream. The design storm data of the City-Parish Department of Public Works was also used. It was found that the major cause of the flooding was from deficiencies in waterway openings of crossings, of roadways and railroads. Submerged pipe crossings also exist, but these were found to have only a small effect on the water level in the bayou. Improvements studied included realignment of the bayou, improvement of the waterway openings, and channel and bank improvement. Major realignment was found not to be feasible because of the cost and poor soil conditions in the area of the proposed realignment. It was recommended that the existing hydraulic deficiencies be corrected and that some channel improvement be done, consisting of bed widening and concrete channelization. Total project cost will be about 1.5 million dollars. (Poertner)
W73-11682

8B. Hydraulics

COASTAL DYNAMICS ALONG MUSTANG ISLAND, TEXAS,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 02L.
W73-11081

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and J. E. Glover.
Available from NTIS, Springfield, Va 22151 AD-748 393, Price $3.00 printed copy; $0.95 microfiche. Technical Report H-72-4, August 1972. 49 p, 20 plate, 7 photo, 5 tab.

Descriptors: *Water control, *Water levels, *Lake Huron, *Navigation, *Model studies, inflow, Rivers, Engineering structures, Environmental effects, Sedimentation, Analytical techniques, Planning, Feasibility studies, Evaluation.
Identifiers: *Submerged sills, *Lake St. Clair River.

The St. Clair River connects Lake Huron and Lake St. Clair. The river, about 40 miles long, is a vital link in the Great Lakes inland navigation system in north central United States. Low lake level experienced in Lake Huron during the early 1960's had a significant detrimental economic impact on the area. In order to increase the water level in Lake Huron, plans for using submerged sills at the head of St. Clair River were proposed. A fixed-bed, 1:60-scale model that reproduced approximately 2.8 miles of the St. Clair River and a small section of the lower end of Lake Huron was used to study the effects of the sills. With the sill arrangements developed, water levels in Lake Huron could be raised by up to 0.75 ft without adversely affecting navigation conditions. A type of sill that would facilitate construction and reduce construction cost could be used without any significant loss in effectiveness. Shoaling along the Canadian shore can be attributed to the movement of sediment into that side of the river, the natural tendency for shoaling on the convex side of a river bend, and the effects of the eddy currents. Sills would tend to reduce the size of the eddy and the tendency for shoaling. Some deposition of sediment could occur along the left ends of some of the sills that would tend to reduce their deposition would tend to be small. (Woodard-USGS)
W73-11089

FINITE ELEMENT SOLUTION FOR GENERAL FLUID MOTION,
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9789, p 913-919, June 1973. 1 fig, 11 ref.

Descriptors: *Finite element analysis, *Numerical analysis, *Flow, Hydrodynamics, Equations, Groundwater movement, Open channel flow, Hydraulics, Fluid mechanics.
Identifiers: *Navier-Stockes equations.

General hydrodynamic equations of the same form as the Navier-Stokes and continuity equations are numerically solved by a variational method based on a quasi-linear variational principle. The finite element decomposition results in a simple linear matrix system that is readily solved by standard first order numerical methods. A pseudo-iterative procedure is used to accommodate the basic nonlinearity of the equations of motion. (Knapp-USGS)
W73-11091

A CASE HISTORY OF SANTA CRUZ HARBOR, CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering.
J. T. Moore.
Available from NTIS, Springfield, Va. 22151 as AD-751 770 Price $3.00 printed copy; 95 cents microfiche. Hydraulic Engineering Laboratory Report HEL-24-14, June 1972. 25 fig, 15 ref.

Descriptors: *Harbors, *Shoals, *Navigation, *California, *Littoral drift, Environmental effects, Construction, Jetties, Boats, Recreation facilities, Reviews, Planning, Coasts, Waves (Water), Sediment transport, Sediment distribution, Ocean currents, Shore protection, Dredging.
Identifiers: *Santa Cruz Harbor (Calif).

Santa Cruz Harbor is a smallcraft harbor located about 80 miles south of San Francisco, California. The harbor was completed in 1964 to meet the needs of a growing boat slip demand and provide shelter from storms. The entrance channel to the harbor has since experienced severe shoaling problems that have greatly reduced the intended year-round use of the facilities. The Santa Cruz Harbor project and maintenance problems that have developed since construction are reviewed. After completion of the jetties in May 1963, approximately 600,000 cubic yards of sand accumulated on the upcoast beach in a 2-year period. From 1965 to 1971 the shoaling became increasingly severe. The increase in shoaling can be linked to the progressive buildup of the upcoast beach. The west jetty has caused a gradual accumulation of sand in comparison with the initial conditions prior to construction. The shoaling of the entrance channel occurs within a short period of time during the storm season and particularly in late winter and early spring. A proposed program of dredging would overdredge the entrance channel in November-December to provide for 200,000 cubic yards of storage as preparation for the winter storm season. Following the storm season the dredge would again restore the channel in April-May for recreational summer boating. (Woodard-USGS)
W73-11092

PROTECTION AND CONTROL OF THE SALT WATER SHORE AREA.
Rhode Island Statewide Planning Program, Providence.
For primary bibliographic entry see Field 06E.
W73-11114

HYDRAULICS OF SHALLOW FLOWS OVER STABLE ERODED SAND SURFACES DEFINED BY AREA SPECTRA,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W73-11192

DISCRETE GRADIENT OPTIMIZATION OF WATER SYSTEMS,
Medical Univ. of South Carolina, Charleston. Dept. of Biometry.
C. F. Lam.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Proceedings paper 9804, p 863-872, June, 1973. 4 fig, 1 tab, 8 ref.

Descriptors: *Water, *Distrubution systems, *Optimization, *Pipes, *Design, Hydraulics, Pipelines, Piping systems (Mechanical), Size, Head loss, Flow, Computers, Systems analysis, Mathematical models, Water supply.
Identifiers: *Gradient techniques.

The cost of a water system depends on the type and size of pipes used; the size of pipes is discrete. With present optimization techniques, diameter of pipes is assumed to be continuous; at the end of the optimization process, the diameters of pipes are then rounded to the nearest commercially available size--this will give an approximate minimum at best, and possibly a nonfeasible solution. A discrete optimization technique is presented to treat pipe diameter as a discrete variable. It has been applied to a fairly large water transmission system with good results. This technique can be used to design a completely new system as well as an expanding one; other pipe networks, such as an oil pipeline and an aircraft fuel system, also can be designed by this method. (Bell-Cornell)
W73-11365

PROBLEM OF THE INFLUENCE OF SHAPE OF CHANNEL CROSS SECTION ON VELOCITY DISTRIBUTION IN A UNIFORM TURBULENT FLOW (K VOPROSU O VLIYANII FORMY SECHENIYA RUSLA NA RASPREDELENIYE SKOROSTEY V RAVNOMERNOM TURBULENTNOM POTOKE),
Dnepropetrovski Khimiko-Tekhnologicheskii Institut, (USSR).
S. A. L'vov.
Meteorologiya i Gidrologiya, No 1, p 68-78, January 1973. 2 fig, 2 tab, 9 ref.

Descriptors: *Channel morphology, *Shape, *Cross-sections, *Velocity, *Flow, Turbulent flow, Uniform flow, Profiles, Surfaces, Graded, Depth, Width, Roughness (Hydraulic), Equations.
Identifiers: USSR.

Theory and techniques for calculation of surface velocities and for approximate calculation of mean vertical velocity distribution in different flows with a steady uniform turbulent motion are discussed. The calculations are based on a coefficient suggested for describing the relative influence of shape of channel on center verticals of certain symmetrical cross sections. (Josefson-USGS)
W73-11408

NEW BITS CAN DRILL MORE HOLE,
L. C. Rogers.
Oil and Gas Journal, Vol 65, No 46, p 118-121, November 13, 1967. 10 fig.

Descriptors: Drilling, *Rotary drilling, *Drilling equipment, Oil industry, Core drilling, Drilling fluids, Technology, Jets, Mechanical equipment, *Design.
Identifiers: *Drill bits, Diamond drilling, *Tungsten carbide inserts, Insert bits, Turbodrills.

Tungsten-carbide insert bits, first developed for drilling hard, brittle rocks are being extended to softer formations previously reserved for milled-tooth bits. Special designs such as chisel-point inserts have made them practical for such applications. Sealed-bearing designs have improved because of broader research and development; this translates into longer bit life. A line of bits designed to combat balling--the extended-nozzle, the four-jet, and the slant-jet bits--are discussed. A filter drill collar designed to flush and lubricate bit bearings is also discussed. Diamond-bit manufacturers have taken a two-pronged approach to ways of increasing penetration rates with diamond bits and core heads: (1) Better stabilization to provide a continuous contact between the diamonds and the bottom of the hole; (2) Ways to improve the cuttings-removal rate so new surface can be presented to the bit, or each diamond, with each revolution. (Campbell-NWWA)
W73-11457

NEW DOWN-HOLE TOOLS IMPROVE DRILLING,
L. C. Rogers.
Oil and Gas Journal, Vol 65, No 47, p 188-196, November 20, 1967. 5 fig, 1 tab, 2 ref.

Descriptors: Drilling, *Rotary drilling, *Drilling equipment, Drill holes, Oil industry, Vibrations, Wells, Deep wells, *Technology.
Identifiers: Stabilizers, Hole deviation, Vibration dampeners, Drill bits, Innovations, Drill pipe.

Some of the latest developments in tools and methods to simplify deviation control and to reduce drill-stem failures include: New stabilizer assemblies which promote longer bit life and prevent sharp 'doglegs'; a novel 'straight-hole' tool which decreases hole angle without sacrificing weight on bit; heavy-weight drill pipe which (a) replaces some of the hard-to-handle collars in directional work, and (b) stiffens the critical transition zone between collars and drill pipe; vibration dampeners which take the 'bounce' out of drilling--regardless of borehole temperature or oil content of the drilling fluid. Relaxation of total-deviation requirements has been responsible for great improvements in drilling rate. Several substitutes for the square collar in preventing hole deviation are now appearing. Several advantages to using heavyweight drill pipe in certain applications are discussed. Drillers are just starting to appreciate the advantages of vibration-dampening tools and several new designs just put on the market reflect renewed interest in this product. (Smith-NWWA)
W73-11458

ROTARY RIG DUE FOR FACE-LIFTING,
L. C. Rogers.
Oil and Gas Journal, Vol 65, No 48, p 75-78, 84, November 27, 1967. 7 fig, 3 ref.

Descriptors: Drilling, *Rotary drilling, *Drilling equipment, Drilling fluids, *Automation, Alternating currents, Direct currents, Generators, *Turbines, Pumps, Oil industry, Offshore platforms, Computers, Technology.
Identifiers: Engines, Internal-combustion engines, Reciprocating engines.

Changes which are occurring and will occur shortly on a rotary rig design include: Turbines are making a bid to replace reciprocating engines as prime movers; single-acting, multiplex pumps are giving the duplex-slush pump some strong competition; a rectified a-c arrangement is being designed which would do away with d-c generators on electric rigs; efforts to automate the rotary rig throughout are being made; computerization is being considered; entirely new types of rigs are being evaluated. Interest in technological innovations is being stimulated by demands for more productivity to curb rising costs and to solve labor problems. The gas turbine's advantages of light weight, small size, quick starts, ease of maintenance, and ability to run on a wide range of fuels make it especially suited to drill rig prime mover application. Compact design, light weight, smooth discharge flow, wide choice of volumes and pressures, low fluid-end replacement costs, and ease of maintenance are the main attractions of the single-acting, half-piston pump for mud service on a rig. (Campbell-NWWA)
W73-11459

HOW TO CUT DRILLING COSTS BY REDUCING NONDRILLING TIME,
Field Drilling Co., San Antonio, Tex.
For primary bibliographic entry see Field 08A.
W73-11460

SALINITY CONTROL ON A BOREHOLE SOURCE IN BUNTER SANDSTONE,
East Shropshire Water Board (England).
For primary bibliographic entry see Field 04B.
W73-11469

OPERATION AND CAPABILITY OF THE BECKER HAMMER DRILL,
Becker Drilling Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 08C.
W73-11470

RADIAL COLLECTOR WELL SOLVES WATER SUPPLY PROBLEM,
Bonestroo, Rosene, Anderlik and Associates, Inc., Mankato, Minn.
R. W. Rosene.
Consulting Engineer, Vol 40, No 2, p 62-64, February, 1973. 3 fig.

Descriptors: Wells, Water wells, *Water supply development, Water consumption, *Water demand, Shallow wells, *Infiltration galleries, Unconsolidated aquifers, Minnesota, Caissons, Construction costs.
Identifiers: Wellfields, *Radial collector wells, Horizontal wells, Mankato (Minn.).

Details of a radial collector well system engineered for the city of Mankato, Minnesota, are given. With projected large increases in water demand caused by an increasing population and industrial growth, one of the city's critical problems was the immediate need to increase its water supply by at least 3 million gallons per day. Construction cost estimates favored the use of vertical well system; however, certain features of the radial collector system, including its ability to be expanded at less cost, and features of operation and maintenance made it more desirable than the vertical well system. Plans for the collector well included a 16 ft. inside diameter concrete caisson with 24 in. thick wall. The caisson was to be sunk 55 ft. to bedrock and to extend 15 ft. above the flood plain. Five horizontal laterals were to be constructed with ports added for the future addition of five more. At completion of the well, pumping tests indicated a capacity of slightly more than 5 million gallons per day from the present laterals and a theoretical recharge capability of approximately 9 million gallons per day at that location without exceeding reasonable drawdown limitations. (Campbell-NWWA)
W73-11473

FOUR PHENOMENA AFFECTING CATHODIC PROTECTION AND CORROSION RATES,
Caproco Corrosion Prevention Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 08G.
W73-11475

ESTIMATING WELL COSTS.
For primary bibliographic entry see Field 08A.
W73-11476

CATHODIC PROTECTION--THE ANSWER TO CORROSION PREVENTION OF UNDERGROUND STRUCTURES,
Hinchman Co., Detroit, Mich.
For primary bibliographic entry see Field 08G.
W73-11477

PROCEDURE IMPROVED FOR DETERMINING CORROSION RATE BY WEIGHT LOSS,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 08G.
W73-11478

DESIGN AND INSTALLATION OF DEEP ANODE GROUNDBEDS,
Cathodic Protection Service, Tulsa, Okla.
R. W. Stephens.
In: Proceedings, University of Oklahoma Corrosion Control Course, Houston, Texas, 1970, p 31/1-31/5. (1970). 3 fig.

Descriptors: Boreholes, Corrosion, *Corrosion control, *Anodes, *Installation, Installation costs, Drilling, Rotary drilling, Chlorine, Iron, Electrical equipment, Electric currents, Electrochemistry, Design, *Design criteria.
Identifiers: Niobium, *Deep anode groundbeds, Platinum, Tantalum.

A deep groundbed is defined as a groundbed in which one or more anodes are installed vertically in a drilled hole at a depth of 50 feet or more. Generally, an 8 or 10 inch diameter hole, drilled to a depth of 100 to 400 feet is the most widely used configuration. Advantages and disadvantages of the deep anode groundbed system are given, when compared with conventional groundbeds. Types of deep groundbed installations are covered, including the standard installation and variations; one has the anodes strapped to a support pipe and a vent pipe and the whole assembly is lowered down the hole. In another type a steel pipe is used as a anode. Some 'exotic' deep groundbeds made of platinum wire wrapped on short sections of Teflon tubing, and platinized or platinum clad titanium, tantalum, or niobium anodes are discussed. Material selection for a deep groundbed installation is more critical than for a conventional bed. Different materials for different conditions are discussed, and an overview of deep anode groundbed installation is given. (Campbell-NWWA)
W73-11480

THE BIGGEST ARTESIAN WELL IN THE WORLD,
Artesia Chamber of Commerce, N. Mex.
For primary bibliographic entry see Field 08A.
W73-11481

REHABILITATION OF IRRIGATION SYSTEMS FOR SALINITY CONTROL,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 03F.
W73-11509

CROP RESPONSE TO TRICKLE AND SUBSURFACE IRRIGATION,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 03F.
W73-11513

WATER INFILTRATION UNDER CENTER-PIVOT SPRINKLERS,
Nebraska Univ., Lincoln.
J. W. Addink, and D. L. Miles.
Paper 72-725, 1972 Annual Meeting American Society of Agricultural Engineers, Chicago, Ill, Dec 1972. 18 p, 8 fig, 3 tab, 9 ref.

Descriptors: *Irrigation engineering, *Infiltration rate, Ponding, *Irrigation efficiency, *Sprinkler irrigation, Soil water movement, Erosion, Infiltration, Irrigation practices, Irrigation systems, Laboratory tests, Moisture content, Nozzles, Rates of application, Soils, Surface irrigation, Surface runoff.

Self-propelled, continuously moving center-pivot sprinkler laterals have become popular because of low initial cost and adaptability for use on rolling, sand soils. Certain characteristics of the center-pivot sprinklers, however, result in substantial runoff at the outer part of the lateral, reducing water-use efficiency and causing decreased crop yields. Laboratory infiltration tests were conducted using 3 simulated center-pivot application-rate patterns to determine which causes the least runoff. One symmetrical and 2 nonsymmetrical patterns were tested on 3 soils--sandy clay loam, loam, and clay loam. The symmetrical pattern was similar to a pattern existing near the outer end of many center-pivot systems in the field; the nonsymmetrical application patterns were humped toward the front. Conclusions are: (1) nonsymmetrical application-rate patterns can potentially reduce runoff under center-pivots by 11% or more, (2) the percent of runoff reduction depends on the shape of the pattern and soil type, and (3) runoff under a nonsymmetrical pattern may increase if the peak application rate is too high or the time length (wetted width) is too short (USBR).
W73-11514

HYDRAULIC DESIGN OF STILLING BASIN FOR PIPE OR CHANNEL OUTLETS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
G. L. Beichley.
Available from GPO, Washington, D C 20402. Price $0.45. Research Report No 24 (A Water Resources Technical Publication), 1971. 27 p, 17 fig, 1 tab, 1 ref.

Descriptors: *Settling basins, *Sedimentation, *Hydraulic models, Energy dissipation, Hydraulic structures, Design criteria, Testing procedures, Open channels, Pipe flow, Velocity, Baffles, Trash racks, Channel morphology.
Identifiers: Franklin Canal (Tex).

High-energy forces in flowing or falling water must be contained or dissipated to prevent damaging scour or erosion of downstream channels. Various means for energy dissipation are employed at hydraulic installations. Stilling basins are among the most common. Ten types, I through X, are used by the Bureau of Reclamation. Development of the Type VI short impact-type basin originated with a need for some 50 or more stilling structures on a single irrigation project. Model studies on 1.6- and 2.4-ft-wide (48.76 and 73.15 cm) Type VI stilling basins were conducted to modify existing standard design procedures. Investigations were concerned with: basin entrance flow conditions including type of entrance, slope, velocity, and Froude number; basin dimensions in relation to the basin width; basin width in relation to Froude number; and riprap size and location. Performance was evaluated in terms of energy dissipation and prototype operation. An optimum tailwater, and alternate end sill design, methods of preventing clogging of the basin, and means for automatic removal of sediment from the basin are suggested. (Woodard-USGS)
W73-11533

ICE FORCES ON VERTICAL PILES,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. E. Nevel, R. E. Perham, and G. B. Hogue.
Available from NTIS, Springfield, Va 22151 as AD-750 358 Price $3.00 printed copy; $0.95 microfiche. Report, 1972. 10 p, 8 fig, 1 tab, 16 ref.

Descriptors: *Piles (Foundations), *Design criteria, *Ice loads, *Surface waters, Engineering structures, Stress, Ice, Winds, Currents (Water), Pressure, Analytical techniques, Testing procedures.
Identifiers: Vertical piles, Ice force.

The force that floating ice sheets can exert on vertical piles is important to the design of both military and civilian structures. Present design codes call for 400 psi as the crushing strength of ice without regard to the influencing factors and their variation. The forces which drive the ice into the structure can be water currents, wind, or thermal expansion. These driving forces may be large enough to cause the ice to fail at or near the structure. The purpose of this research was to define this limiting force level and gain a better understanding of the failure process in the ice. The most important result is the identification of the different modes of failure. The failure mode has a pronounced influence on the peak nominal stress. Although the general trends observed should extend to full scale, the specific peak nominal stresses may not. (Woodard-USGS)
W73-11538

ANALYSIS OF LAKE ERIE WAVE PRESSURE DATA,
Northern Illinois Univ., De Kalb. Dept. of Geography.
A. L. Cole.
Available from NTIS, Springfield, Va 22151 as AD-753 960 Price $3.00 printed copy; $0.95 microfiche. Final Report (NIU Project 54586), July 1972. 54 p, 24 fig, 6 tab, 4 ref. USAE Contract DACW 35-70-C-0015.

Descriptors: *Waves (Water), *Breakwaters, *Lake Erie, Hydraulic models, Design criteria, Shore protection, Engineering structure, Pressure, Data collections, Correlation analysis, Evaluation.
Identifiers: Wave pressure data (Breakwaters), Wave heights, Pressure profiles.

Measured wave heights, wave periods, mean water level increases, and depths of water at a breakwater on Lake Erie at Lorain, Ohio, were used to compute pressure profiles on the breakwater during nonbreaking wave reflections. These computed pressure profiles were evaluated with wave pressure measurements taken concurrently. The rather close agreement between the experimental pressure profiles and the Sainflou predictions indicate that Sainflou's theory can be used for breakwater design purposes in the Great Lakes. The apparent greater wave pressure at still-water level than that predicted by Sainflou could be adjusted empirically or could be absorbed by a reasonable safety factor. The simplicity of the Minikin formulation and its relatively close fit to the experimental data could make it a choice for design purposes. From observations of damage to life preserver supports on the Lorain breakwater and damage to the original instrument shelter used in 1968, it seems that impact damage due to logs and other debris in the water must be an important consideration in the design of any breakwater. The material of a breakwater must be able to withstand the impact of a 2- or 3-foot diameter log slamming into it during a storm situation. The rubble-filled and concrete-topped steel caissons used at Lorain showed no log damage and apparently are quite satisfactory. (Woodard-USGS)
W73-11548

SIMULTANEOUS, MULTIPLE-LEVEL RELEASE FROM STRATIFIED RESERVOIRS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. P. Bohan, and T. L. Gloriod.
Available from NTIS, Springfield, Va., 22151 as AD-754 536 Price $3.00 printed copy; $0.95 microfiche. Research Report H-72-3, December 1972. 37 p, 5 fig, 11 plate, 4 ref.

Descriptors: *Density stratification, *Stratified flow, *Withdrawal, *Hydraulic models, *Water quality control, Water pollution control, Destratification, Reservoir releases, Model studies.

The withdrawal zone resulting from the simultaneous release of flows from a randomly stratified impoundment through outlets located at different elevations was studied by use of a hydraulic model. Superimposing the separate and distinct velocity profiles for each of the outlets based on single-outlet operation to obtain the composite velocity profile, due to simultaneous release through two outlets, did not yield completely satisfactory comparisons between predicted and observed results. Further analyses yielded a generalized technique which involved a controlled shift of the withdrawal limits in the zone of overlap prior to superimposing the two separate and distinct velocity profiles. This technique yielded good agreement between observed and predicted selective withdrawal characteristics. When the composite velocity profile in the reservoir has been determined by the recommended method, a weighted-average technique can be applied to determine the value of any water-quality parameter in the outflow for which a vertical distribution within the reservoir is known. (Knapp-USGS)
W73-11567

8C. Hydraulic Machinery

ROTARY RIG DUE FOR FACE-LIFTING,
For primary bibliographic entry see Field 08B.
W73-11459

OPERATION AND CAPABILITY OF THE BECKER HAMMER DRILL,
Becker Drilling Ltd., Calgary (Alberta).
D. W. Bennett.
Canadian Mining Journal, Vol 88, No 1, p 35-37, January 1967. 4 fig.

Descriptors: Drilling, *Drilling equipment, Drilling samples, Drill holes, Unconsolidated sediments, Gravels, Canada, Pipes, Air circulation, *Application equipment, *Water wells, Well casing.
Identifiers: *Hammer drills, Drill bits, Drill pipe, Mobility.

In the method of drilling described, casing is driven ahead by a diesel operated pile hammer, while air, under pressure, is forced down the annulus of a double wall casing. The air, under a pressure of about 40 psi returns up through the inside casing bringing with it material cut by the drill bit. Water or drilling fluid can be useation of chlorophyll. A direct relation is observed between organic carbon and the contents of humic acids and chlorophyll-like pigments in all samples. Maximum concentrations of organic carbon (up to 20%), humic acids (up to 2.5%), and pigments (up to 0.1%) were found in sapropel of paleoeuxinic sediments. Considerably smaller amounts of these compounds were dound in neoeuxinic sediments and in shelf sediments laid down in oxygenated water. High concentrations of chlorophyll and pheophytin were observed in paleoeuxinic sediments. Accumulation and preservation of chlorophyll, pheophytin, and humic acids in Black Sea sediments, character of the sedimentary facies, lithology and particle-size distribution of the sediments, and the sedimentation rate. (Josefson-USGS)
W73-11470

NUCLEAR DUAL PURPOSE PLANTS IN REGIONAL DEVELOPMENT,
Atomic Energy Commission, Oak Ridge, Tenn.
For primary bibliographic entry see Field 03A.
W73-11496

ALL-POSITION PRODUCTION WELDING WITH FLUX-CORED GAS-SHIELDED ELECTRODES,
Meyer Industries, Inc., Red Wing, Minn.
M. Hoitomt, and R. K. Lee.
Weld J, Vol 51, No 11, p 765-768, Nov 1972. 11 fig, 1 photo, 1 tab.

Descriptors: Welding, Quality control, Transmission lines, Aesthetics, Costs, Right-of-way, Erection, Foundations, *Steel structures, Electrodes, Welded joints, *Fabrication, *Transmission towers.
Identifiers: *Tapered steel poles, On-site assembly, *Arc welding, Welds, Welding torches.

Tapered steel poles are being used more widely to support high voltage transmission lines, lighting complexes, and other operations which must be held in an elevated position. Because these poles are large in size, many production problems had to be solved to manufacture a reliable product. Tapered steel poles each weighing up to 80 tons and having an installed height of 260 ft. are being made. When several poles are combined, structures can be built to a height of 460 ft. An advantage of steel poles is simplicity of on-site erection. The foundation is prepared, all hardware installed on the ground, and then the pole raised into position and bolted in place. Advantages of tapered steel poles over steel latticework towers used in the past are: (1) esthetically better in appearance; (2) smaller base area required reduces right-of way costs; and (3) increasing span lengths by using taller poles reduces number of structures per mile. Using the gas-shielded flux-cored arc welding process has improved welding efficiency by as much as 100% in the fabrication of tapered steel poles, and assured better quality of the finished product. (USBR)
W73-11501

CONTROL OF INSULATOR CONTAMINATION IN SUBSTATIONS,
Florida Power and Light Co., Miami.
J. R. Massey.
Journal of the Franklin Institute, Vol 294, No 6, p 375-383, Dec 1972. 20 fig, 3 append.

Descriptors: Salts, Cleaning, Electric power failure, Substations (Electrical), Performance, *Power operation and maintenance, Switchyards (Electrical), Transmission (Electrical), Suspension insulators.
Identifiers: *Washing, Electrical insulators tests, Contamination, Wet condition, Flashover, Silicones, Dielectrics, Salt removal, Suspension insulators.

Problems associated with contamination of insulators have been recognized for over 70 yrs. Procedures used by the Florida Power and Light Company which have resulted in 6 yrs of virtually flashover-proof operations of substations located in high contamination areas are discussed. Salt contamination is more severe in coastal areas, but measurable contamination exists in all parts of the world. Contamination remains today the biggest unsolved insulator problem. Primarily, problems of salt contamination in substations and switchyards are described. Problems encountered, equipment rating and condition, possible solutions, kinds of contamination, methods of combating contamination, and frequency of maintenance are discussed. Conclusions are that: (1) work presently being done to control insulator contamination is of a temporary nature; (2) removal and replacement of silicone grease is necessary after about 2-3 yrs; (3) increased insulation reduces the need for washing between rainstorms; (4) washing can be a continuing expense unless sufficient rain falls to keep the porcelain clean; (5) conductive glaze shows promise, but must be proven; and (6) improved insulator design may improve performance. (USBR)
W73-11506

REPORT OF THE UNITED STATES DELEGATION VISIT TO THE SOVIET UNION: JULY 24 TO AUGUST 6, 1972,
Bureau of Reclamation, Washington, D.C.
E. L. Armstrong.
Report Electr Power Transm Power Generation Facil, US-USSR Exchange Agreement, Moscow, July-Aug, 1972, Dec 1972. 24 p, 2 map, 29 photo.

Descriptors: *Transmission lines, *Foreign projects, Hydroelectric power, Power transformers, Electrical design, Extra high voltage, Substations (Electrical), Alternating current, Direct current, Turbines, Transmission (Electrical), Generators.
Identifiers: Hydroelectric powerplants, Ultra high voltage, Bratsk Powerplant (USSR), Irkutsk Powerplant (USSR), Bratsk Dam (USSR), Volgograd-Donbass Line (USSR), Volgograd Powerplant (USSR), USSR, Power grids, Power dispatching, Converters (Electrical).

Under the 1972 US-USSR Exchange Agreement, the first US delegation spent 2 wks visiting high-voltage transmission and hydroelectric power facilities in the USSR. The first stop was Moscow where the Chagino Substation, the Central Dispatching Center, ELECTRO-72 Exposition, and the Lenin All-Union Electro-Technical Institute were visited. The Konakovo Steam Power Station, 137 km north of Moscow, was on the next stop. A 750-kv, a-c transmission line connects this power station with Moscow. In Leningrad the Research Institute of Direct Current, Electrosila, and the Leningrad Metal Works were toured. In these plants large generators and turbines are manufactured for installation throughout the USSR. The Volgograd Hydroelectric complex was next, where the d-c Converter Station for the 800-kv, d-c line to the Donbass area is located. The greatest distance between tour sites was to Irkutsk, Siberia, 3200 mi from Moscow, where the Irkutsk Hydroelectric Plant, Bratsk Dam and Powerplant, and Lake Baikal were visited. A short discussion is iven on each installation. (USBR)
W73-11508

SOLUTION OF PROBLEMS ON INTERCONNECTED AC SYSTEMS BY MEANS OF HVDC TRANSMISSION SYSTEMS,
R. Bartenstein, and E. Rumpf.
Paper Int Conf Large High Tension Electr Syst (CIGRE), Study Comm No 32, Jan 1972. 15 p, 2 fig, 15 ref.

Descriptors: *Extra high voltage, *Direct currents, Alternating currents, Transmission (Electrical), Reliability, Costs, Electric power demand, Electric power production, Bibliographies, Foreign research, Power operation and maintenance, Europe.
Identifiers: Load flow, Germany, Overcurrent, Valves (Electrical), *Interconnected systems, *Thyristors, *Power grids.

CIGRE Study Committee 32 (system planning and operation) discusses large electrical power supply networks operated in an interconnected AC system. Topics commented upon are: (1) questions confronting the planning engineer; (2) control, protection, and reliability of HVDC transmission systems with thyristor valves; (3) possible application of HVDC systems; (4) coupling of networks; (5) feed-in of generating capacity; (6) integration of an HVDC system into the AC interconnected system; and (7) superimposed HVDC interconnected systems. Expected increases in power consumption in the next 2 decades will present many technical problems in operating the 400-kv AC interconnected system in Europe. Applying HVDC transmission as short distance links and for feed-in capacity may solve some of these problems. Reliability and availability are important criteria in considering HVDC transmission for interconnected grid systems. Marked improvement is expected from using thyristor valves. (USBR)
W73-11521

8D. Soil Mechanics

BEHAVIOUR OF FINE SANDS AND SILTS DURING THE RISE OF GROUND-WATER LEVEL,
Ceskoslovenska Akademie Ved, Prague. Ustav Teoretiche a Aplikovane Mechaniky.
For primary bibliographic entry see Field 02G.
W73-11194

PORE PRESSURE MEASUREMENTS IN AELOTROPIC PEAT,
Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W73-11195

INFLUENCE OF WEATHERING ON EFFECTIVE VALUES OF SHEAR STRENGTH OF MIOCENE CLAY,
For primary bibliographic entry see Field 02K.
W73-11196

RELATIONSHIPS BETWEEN VOLUME AND PORE-WATER CHANGE AND SHEAR STRESS IN GRANULAR SOILS,
Ceskoslovenska Akademie Ved, Prague. Ustav Teoreticke a Aplikovane Mechaniky.
For primary bibliographic entry see Field 02G.
W73-11197

BEHAVIOUR OF TRANSITION SOILS UNDER THE EFFECT OF WATER,
Technical Univ. of Budapest (Hungary).
For primary bibliographic entry see Field 02G.
W73-11198

GROUND RUPTURE IN THE BALDWIN HILLS,
Earth Sciences Associates, Palo Alto, Calif.
For primary bibliographic entry see Field 05E.
W73-11206

EFFICIENCY OF WELL SCREENS AND GRAVEL PACKS: FINAL REPORT OF RESEARCH PANEL, NO 6.
Institution of Water Engineers, London (England).

Institution of Water Engineers Journal, Vol 23, No 6, p 355-368, June, 1969. 2 fig, 6 ref.

Descriptors: Wells, Water wells, *Well casings, *Well screens, *Gravels, Efficiencies, Unconsolidated aquifers, Hydraulics, Hydraulic structures, *Specific yield, Drilling, Drilling equipment, Rotary drilling.
Identifiers: *Gravel packing, Cable tool drilling.

A Research Panel was set up to investigate the efficiency of well screens and gravel packs used in the construction of water wells, taking into account the strata concerned. Conclusions reached by the panel include: Where physical conditions permit, the reverse-circulation drilling method should produce the most satisfactory results. Consideration should be given to the mechanical strength of the screen tube material to withstand the conditions occurring and to the effect of the water quality on the corrosion-resistance of this material. Although costly, stainless steel tubes would normally be recommended. It was found through experimentation and survey that both even-sized grain size and graded-grain size gravel packs can give perfectly satisfactory results, provided that precautions are taken to minimize segregation in placing a graded pack. Subjects worthy of further investigation are also noted. (Smith-NWWA)
W73-11474

EXPANSION OF CYLINDRICAL PROBES IN COHESIVE SOILS,
Laboratoire Central des Ponts et Chaussees, Paris (France).
F. Baguelin.
J Soil Mech Found Div, Am Soc Civ Eng, Vol 98, No SM11, p 1129-1142, Nov 1972. 11 fig, 1 tab, 15 ref, 2 append.

Descriptors: *Soil tests, Pressure measuring instruments, *Cohesive soils, Earth pressure, Boreholes, Theoretical analysis, Soil mechanics, Bibliographies, Stress, Expansion, Soil properties, Shear strength.
Identifiers: *Menard pressuremeter, *Pressure probes, France, Foreign studies.

Cylindrical expansion tests cannot only solve foundation problems by empirical method but are also a means to study the undrained behavior of cohesive soils. Standard cylindrical expansion tests are usually performed in boreholes or after driving in coarse soils. A new pressure probe, the autoforeuse, has been developed and is much more sophisticated than the standard probe. The new device is a thin walled sampling tube (8 cm dia) with a pressure probe section of 0.2 mm smaller diameter than the cutting edge. The small difference in dimensions between the probe and cutting edge causes little movement in the soil before the expansion test begins. As the probe is pushed or rotated downward, the sample is chopped by a rotating tool and a fluid causes the cuttings to flow up the center of the device to the ground surface. Undrained soil tests at controlled deformation rates are performed by connecting the probe to a waterfilled cylinder with a piston. Theoretical analysis shows that the undrained stress-strain curve of the soil can be derived from the pressure meter curve. Information obtained from a few cohesive soils includes: horizontal at rest pressure, undrained stress-strain curve, and in situ undrained cohesion. (USBR)
W73-11520

WETTING REQUIREMENTS TO IMPROVE COLLAPSING FOUNDATION SOILS,
Bureau of Reclamation, Denver, Colo.
J. P. Bara.
Paper, American Society of Civil Engineers, Annu Natl Environ Eng Meet, Houston, Tex, Oct 1972. 22 p, 9 fig, 1 tab, 8 ref.

Descriptors: *Foundation investigations, Infiltration, Ponding, Foundations, Seepage, Wells, Soil investigations, Infiltration rates, *Subsidence, Subsurface investigations, Soil mechanics, Liquid limits, Wetting, Sprinkling, Settlement (Structural), *California.
Identifiers: *Collapsing soils, San Luis Canal (Calif), Hydrocompaction, Collapse phenomenon, Westlands Distribution System (Calif).

In California, approximately 100 mi of pipelines (of up to 5 ft dia) and 30 pumping plants and reservoirs will be built on collapsing soils. To avoid structural problems caused by differential settlement from future irrigation along the water distribution system, collapsing soils are wetted before construction to produce a more stable foundation condition. To evaluate methods of wetting collapsing soils, test sections were installed using flooding and sprinkling methods with and without vertical infiltration wells. Results indicate: (1) surface flooding or sprinkling in conjunction with 40-ft deep wells on 40-ft centers collapsed a 50-ft depth of soil in only 30 days; (2) surface flooding or sprinkling without wells conserves water, but takes 60 to 90 days to reach a 50-ft depth, providing impervious layers do not prevent vertical infiltration; and (3) surface flooding with 100-ft deep wells on 100-ft centers required 4 months wetting time to reach a depth of 110 ft. Soil samples of the foundation material are taken for liquid limit tests. Collapse of the foundation soils may occur when the soil liquid limit moisture is less than soil moisture at saturation. (USBR)
W73-11526

8E. Rock Mechanics and Geology

LOCATION AND DETERMINATION OF DEPTHS OF SUBSURFACE UNDULATIONS BY SEISMIC METHODS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
S. R. Smith.
M Sc Thesis, 1971. 83 p, 21 fig, 1 tab, 13 ref, 4 append. OWRR A-026-KY (1).

Descriptors: *Subsurface investigations, *Geological surveys, *Geologic formations, *Beds (Stratigraphic), *Seismic studies, Geomorphology, Depth, Methodology, Data collections, Computer models, Correlation analysis, Boreholes, Curves.
Identifiers: *Subsurface undulation measurement, Rock profiles.

The refraction survey provides a method for investigating the subsurface. Seismic waves, produced by impacts of a sledge hammer on a steel plate, are transmitted into the earth and received by vibration detectors placed at the rock surface. The lapsed time between impact and pickup is measured over 2-foot intervals in the survey. Elapsed times are plotted versus the horizontal distances between impact and detector. Computer simulation of the seismic refraction process was developed and the traveltime curves of horizontal, dipping, hump, vee, double-vee, and triple-vee rock profiles were obtained. Equations for traveltime curves were written to evaluate depths. The results of the data were quite accurate as verified by auger borings at 5-foot intervals along the survey line. Appendices with the derivation of equations are included as well as the computer programs used to obtain the computer traveltime curves and a diagram for each program to illustrate the input. (Woodard-USGS)
W73-11398

TYPICAL LOG-CURVE SHAPES INDICATE FORMATION CHARACTERISTICS,
Dresser Industries, Inc., Houston, Tex.
For primary bibliographic entry see Field 08A.
W73-11456

ABNORMAL PRESSURES IN DEEP WELLS OF SOUTHWESTERN LOUISIANA,
Tulsa Univ., Okla.
P. A. Dickey, C. R. Shriram, and W. R. Paine.
Science, Vol 160, No 3828, p 609-615, May 10, 1968. 7 fig, 1 tab, 22 ref.

Descriptors: Wells, *Deep wells, Louisiana, Oil industry, Geologic investigations, Geologic control, *Faults (Geologic), *Hydrostatic pressure, Shales, Diagenesis, Compaction, Sedimentary structures, Sedimentation, *Pore pressure.
Identifiers: Salt domes, Slumps (Geologic).

In drilling deep wells in southwest Louisiana, fluids--either oil, gas, or water--at pressures much higher than normal hydrostatic pressure are often encountered. Complex 'down to the basin' growth faults were found to exist in the area, which seal the flow of fluids; down-dip from these faults abnormally high pressures are found. Shales in these intervals are less compacted than is usual at the depth at which they are buried, since the normal processes of compaction and diagenesis were arrested by the faulting. The pore water has remained in the sediments, where it has to support part of the weight of the overburden, and its hydrostatic pressure is, therefore, much above normal. In a few areas, called embayments, the growth faulting caused certain stratigraphic units to be abnormally thick, and the abnormal pressures are found at particularly shallow depths. (Smith-NWWA)
W73-11464

STUDY OF THE BEHAVIOR OF A ROOF WITH VARIOUS BOLTING SYSTEMS,
O. Leonet, P. Sinou, and E. Tincelin.
Paper III-6, Symp Int Soc Rock Mech, Nancy, France, 1971. Transl from Fr, Bur Reclam Transl 860, Jan 1973. 17 p, 8 fig, 3 ref.

Descriptors: *Rock bolts, *Rock mechanics, Tunnel construction, Anchor bolts, Structural behavior, Unlined tunnels, Strain, Resins, Loads (Forces), Load distribution, Mines, Tunnels, Grouting.
Identifiers: Expansion bolts, France, Foreign studies, *Roof bolts.

Roof deflections of an iron mine were measured in areas strengthened by expansion bolts (point anchorage) and concrete- or resin-sealed bolts (distributed anchorage). In all test series, the thickness of roof supported was 1.75 m and the bolts used were: (1) expansion bolts, 1.8 m long, installed vertically; (2) expansion bolts, 3 m long, installed at 55 deg slant; and (3) concrete-sealed notched steel bolts, 1.8 m long, installed vertically. Deflection results after 8 yrs indicated insignificant differences between roof performance with slanted or vertical expansion bolts, but showed about a 33% deflection decrease with concrete-sealed bolts. Tests with resin-sealed bolts were performed under worse geologic conditions, but also indicated better deflection performance than with expansion bolts. Behavior of the roof with resin-sealed bolts was essentially the same whether the bolt shanks were notched or smooth. To better understand the functioning of resin-sealed bolts, bolt shanks were instrumented with strain gages before being sealed into the roof. Test results indicate: (1) nonuniform distribution of load in the shank, (2) very low stresses in the first 20 cm of shank from the roof indicating that a plate should be applied to the roof, and (3) possibly poor shank attachment near the end of the hole. (USBR) (U)
W73-11503

8F. Concrete

DIAMOND BITS CORE SAMPLES OF NEW YORK ROADS.
For primary bibliographic entry see Field 08A.
W73-11461

WET WELL WOES,
Saint Petersburg Beach City Engineers, Fla.
For primary bibliographic entry see Field 08A.
W73-11462

FLEXURAL FATIGUE STRENGTH OF STEEL FIBER REINFORCED CONCRETE BEAMS,
Clarkson Coll. of Technology, Potsdam, N.Y.
G. Batson.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 11, p 673-677, Nov 1972. 1 fig, 4 tab, 12 ref.

Descriptors: *Reinforced concrete, Beams (Structural), Deflection, Loads (Forces), Laboratory tests, Concrete technology, Concretes, Failure (Mechanics).
Identifiers: *Fatigue tests, *Flexural strength, *Reinforcing materials, *Steel fibers, Microcracks, Composit beams, Cracking, Cyclic loads, Fibers, Static tests, Dynamic tests, Concrete tests, Fatigue (Materials), Test results.

To determine the effectiveness of steel fiber reinforcement in resisting fatigue loads, beams containing different sizes of fiber and percentages by volume of mortar, were cast and tested in flexural fatigue. The test program consisted of static and cyclic flexural loading of concrete beams reinforces with short lengths of randomly spaced steel fibers. 130 beams, 4 by 6 by 102 in. were cast. Fibers were made from hard-drawn, low-carbon

steel wire cut to specified lengths. Tensile strength of the wire as drawn was approximately 200,000 psi. Several sizes of steel fibers were used as reinforcement in concentrations of 2.00 and 2.98% by volume of concrete. Statistical analysis of test data indicated fatigue strengths of 74 and 83% of the first crack static flexure strength at 2 million cycles of complete reversal and nonreversal loading, respectively, were obtained for a steel fiber content by volume of 2.98%. Postfatigue static flexure strength was greater than the prefatigue static flexure strength. Beams failed by the pulling out of the fibers, not by breaking them. (USBR)
W73-11498

SIMPLIFIED COMPUTER APPROACH TO THE ULTIMATE LOAD ANALYSIS AND DESIGN OF REINFORCED CONCRETE FRAMES,
Indian Inst. of Tech., Madras.
C. S. Krishnamoorthy, and C. W. Yu.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 11, p 690-698, Nov 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Structural analysis, *Frames, *Ultimate strength design, *Reinforced concrete, Beams (Structural), Bending moments, Columns, Structural design, Compatibility, Computer programs, Hinges, Loads (Forces), Moments, Moment distribution, Foreign research, Concrete structures, Buildings.
Identifiers: *Limit design, *Plastic hinges, Limit analysis, Computer-aided design, Great Britain, Supports, Structural concrete.

An efficient and practical procedure is presented for utlimate load design of reinforced concrete frames. The proposed procedure, by adjusting rotation for the simplified limit method, provides rapid convergence of solution. A computer program was developed for analyzing reinforced concrete frames for 5 different cases of hinge pattern under 2 ultimate loading conditions. Three multistory frames were designed to illustrate the use of this program. Salient details of design and analytical results are presented. Amount of moment redistribution in these frames is discussed. The frames were tested analytically to determine actual load at failure using a separate program developed for stage-by-stage analysis of reinforced concrete frames. The program is capable of determining the moment redistribution at all critical sections for the specified cases of hinge pattern. Practical examples of multistory frames are presented to illustrate that the recommended design procedure is efficient and practical. (USBR)
W73-11499

BITUMINOUS BLANKET FOR DIKE AT LUDINGTON PUMPED STORAGE PROJECT,
Strabag Bau A.G., Cologne (West Germany).
J. Lehnert, and F. P. Robertson.
Civ Eng Vol 42, No 12, p 54-57, December 1972. 2 fig, 5 photo.

Descriptors: Asphalts, *Bituminous materials, Binders, Linings, *Reservoir construction, Erosion control, *Construction, *Construction materials, Pumped storage, Construction equipment, *Dikes.
Identifiers: Asphalt moisture barriers, Ludington Pumped Storage Project (Mich), *Impervious blankets, *Bituminous concretes.

Although over 20 pumped storage reservoirs have been built in the European area with bituminous seals, the Ludington Project on the eastern shore of Lake Michigan is only the third built in the US. Ludington, with a peaking power generation of 1.87 million kw, will be the most powerful pumped storage project in the world. The 80,000 acre-ft reservoir is surrounded by a fine sand and silt dike with a crest length of 5.6 mi and average height of 103 ft. To seal the reservoir, the inner slope of the dike is paved with 2 blankets of asphalt separated by a layer of drain rock. A 3- to 5-ft-thick layer of impervious clay lines the reservoir bottom and overlaps the asphalt blankets. Much of the asphalt used, called hydraulic asphalt concrete, has a higher mineral filler content than normally used in the US. When undergoing differential settlement, bituminous blankets have a self-healing property not found in portland cement concrete blankets. To place 513,000 tons of asphalt concrete and 390,000 cu yds of drain rock in a 11-1/2-mo period, special paving rigs and materials handling methods were developed. (USBR)
W73-11504

TORSIONAL STIFFNESS OF REINFORCED CONCRETE MEMBERS SUBJECTED TO PURE TORSION,
Chalmers Univ. of Technology, Goteborg (Sweden).
I. Karlsson, and L. Elfgren.
Mag Concr Res, Vol 24, No 80, p 149-156, Sept 1972. 14 fig, 19 ref.

Descriptors: *Reinforced concrete, *Failure (Mechanics), *Stress analysis, *Beams (Structural), Deformation, Rotation, Structural analysis, Structural design, Structural behavior, Structural engineering, Loads (Forces), Theoretical analysis, Cracking, Cracks, Foreign research, Bibliographies.
Identifiers: Sweden, Torsion, Stiffness, Moments, Cracking, Test results.

A theoretical investigation on the stiffness variation of cracked concrete members loaded by a pure torsional moment is summarized. Knowledge of this property and the influence of cracking, is essential for estimating the magnitude of deformation. The method used for determining stiffness is based on a truss analogy for torsion. Stresses in the reinforcement and concrete of a beam under torsional load at the cracked stage were deduced. Theoretical expressions for the torsional stiffness were then obtained for members of arbitrary and rectangular cross sections. Theoretical values agreed well with experimental results for rectangular beams with the same areas of transverse and longitudinal steel. Increases in deformation after cracking can be seen by comparing stiffness values for a solid rectangular section at the uncracked and cracked stages. Stiffness decreases considerably after cracking and may diminish to levels of about 5% of the original value. Applicability of the theory is discussed briefly and a procedure given for correcting imperfections. (USBR)
W73-11519

CEMENT MORTAR LINING OF 20-FT DIAMETER STEEL PIPE,
Ameron Pipe Lining Div., Wilmington, Calif.
J. E. Wolfe.
Transp Eng J, American Society of Civil Engineers, Vol 98, No TE4, p 837-845, Nov 1972. 5 fig, 2 ref.

Descriptors: Aqueducts, Conduits, Conveyance structures, Hydraulic structures, Pipelines, Pressure conduits, *Steel pipes, *Mortar, Cements, Protective coatings, Tunnels, *Tunnel linings, Tunnel construction, Precast concrete.
Identifiers: California Aqueduct, *Pipe linings, *Tunnel supports, Liner plates.

The rapid advancement in the art of cement mortar lining of steel pipelines has led to the application of in-place mortar lining in a 20-ft-dia steel cylinder in 2 tunnels and 1 siphon, for 9650 linear ft. These structures are part of the Foothill Feeder system of the Metropolitan Water District of Southern California (MWD). Because of size, these structures were originally designed for 2-in.-thick mortar lining placed by the gunite method. However, 2 yrs of experiments demonstrated that 1-1/2 in. of mortar lining could be applied in the 20-ft-dia range and give a dense, tight-to-the-wall, smooth lining without using wire mesh. As a result of the experiments, MWD accepted a design change because of cost savings and better performance. The techniques used in lining these large conduits are described. The lining was installed in 2 applications, each 3/4-in. thick. The second application (troweled) was placed 1 day following the first pass (untroweled). Besides being the largest pipe ever lined by this method, lining was applied at a distance 6 times greater than normal from the access opening, and the quantity of mortar placed per day per crew was approximately 3 times greater than ever before. (USBR)
W73-11522

INTERNAL CRACKING IN REINFORCED CONCRETE MEMBERS,
King's Coll., London (England).
J. M. Illston, and R. F. Stevens.
Paper CP 15/72, Build Res Sta, G B, p 28-31, Aug 1972. 5 fig, 7 ref.

Descriptors: Concretes, Reinforcement, *Reinforced concrete, *Concrete tests, *Cracks, Corrosion, Beams (Structural), *Resins, Tensile stress, Bonding, Codes, Foreign research, Investigations, Laboratory tests.
Identifiers: Great Britain, *Cracking, Composite beams.

Surface cracking of reinforced concrete members in the tensile zone has always been viewed with concern because of unknown conditions inside the members. To investigate the process of cracking and the practical implications, loaded reinforced concrete beams and cylinders were injected with resins and sawn open to reveal the internal pattern of continuous cracking. The test confirms that at the working level of steel stress, the crack spacing is a function of concrete cover, and the external crack width is a function of crack spacing and steel stress. In all cases, positions of the main continuous cracks were marked by resin staining the bar recess and bar surface. Splurges of resin indicate breakdown of adhesion bond but not necessarily complete loss of bond action. Typical cracks take a distorted form and only can be properly examined in 3 dimensions. The process of cracking as the stress in the steel is increased is explained in 4 stages of development. Observations indicate that the width of a single crack is a most variable quantity; therefore, measurements are unlikely to be reproducible. (USBR)
W73-11523

8G. Materials

OXYGEN--A MAJOR ELEMENT IN DRILL PIPE CORROSION,
Shell Development Co., Houston, Tex.
B. W. Bradley.
Materials Protection, Vol 6, No 2, p 40-43, December 1967. 9 fig, 2 tab, 5 ref.

Descriptors: Corrosion, Corrosion control, Erosion, Drilling, Drilling equipment, Drilling fluids, Wyoming, Louisiana, Oil industry, Sea water, Pitting (Corrosion), *Oxygen, Cracks, Laboratory tests, Hydrogen ion concentration.
Identifiers: Scavenging (Chemical).

Recently oxygen was suspected to cause internal corrosion of drill pipe which was circulated with lignosulfonate drilling mud. Tests were conducted to determine if this suspicion was justified and to determine the precise effect by measuring corrosion rates. A correlation was indicated in the results between oxygen concentration of the drilling fluid, corrosion and pitting. Conclusions reached from data presented are: Corrosion at different locations with the ligno-sulfonate mud was

approximately the same; untreated sea water mud was twice as aggressive to drill pipe rings as lignosulfonate mud; at one location the upper ring tended to be attacked more than the lower ring. This is compatible with the concept of oxygen scavenging by the mud, and therefore, reduced corrosion, as the mud travels down the drill pipe; when the exposure time was tripled, the corrosion rate was reduced four times; velocity may cause erosion effects which overshadow simple corrosion. (Campbell-NWWA)
W73-11453

HIGHLY RESISTANT COPPER DETERIORATES IN SEVERELY CORROSIVE SOILS,
National Bureau of Standards, Washington, D.C.
W. J. Schwerdtfeger.
Materials Protection, Vol 7, No 9, p 43-44, September 1968. 2 fig, 1 tab, 3 ref.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, Anodes, Cathodes, Soil chemical properties, Acidity, Pitting (Corrosion), Resistivity, Materials, *Soils, *Copper.
Identifiers: Sulfuric acid, *Galvanic corrosion.

Tests were conducted to establish the amount of cathodic protection necessary for copper in a severely corrosive soil. It is generally assumed that copper has a higher resistance to corrosion in soils than do the other commonly used metals, but data indicate that the corrosion rate of copper in severely corrosive soils can be quite rapid. Experimental methods plus results of tests which concern copper corrosion are discussed. The laboratory data discussed indicate that the break in the cathodic polarization curve is a reasonable criterion of cathodic protection. At times, the cathode potential did not differ from the control potential by more than 50 MU. Corrosion was under cathodic control. Should copper need protection in similar very corrosive environments, a minimum charge of 100 MU might be a reasonable criterion. (Smith-NWWA)
W73-11454

CORROSION OF METALS IN TROPICAL ENVIRONMENTS--COPPER AND WROUGHT COPPER ALLOYS,
Naval Station, Canal Zone. Fuel Div.
C. W. Hummer, Jr., G. R. Southwell, and A. L. Alexander.
Materials Protection, Vol 7, No 1, p 41-47, January 1968. 10 fig, 3 tab, 18 ref.

Descriptors: *Corrosion, Corrosion control, *Tropical regions, *Copper, *Copper alloys, Panama canal, Bronze, Sea water, Cathodic protection, Anodes, Aluminum, Aluminum alloys, Steel.
Identifiers: Dezincification, Panama, Brass, *Atmospheric corrosion.

The corrosion of copper and nine wrought copper alloys is reported for exposures in five tropical environments for periods of 1, 2, 4, 8, and 16 years. Weight loss, depth of pitting, and change in tensile strength were measured to evaluate corrosion resistance. Specific areas discussed include underwater corrosion of copper alloys, dezincification of brasses, galvanic effects, biofouling of copper vase metals, and atmospheric corrosion of copper alloys. Five exposure sites were involved, covering marine atmospheric, tropical fresh water, inland atmospheric, tropical sea water lagoon, and ocean environments. Weight loss, pit depth, and dimensional change were determined by standard procedures. Copper and copper alloys exposed to tropical sea water show weight losses from 1.4 to 2 times greater than in temperate waters. Tropical marine atmospheres also cause higher weight loss to cuprous metals. Heavy dezincification occurred in the A plus B brasses in sea water. (Campbell-NWWA)
W73-11455

EXTERNAL CORROSION OF BURIED FERROUS PIPELINES/1,
Harco Corp., Hawthorne, Calif.
H. W. Hosford.
Water and Wastes Engineering, Vol 6, No 11, p 45-47, November 1969. 5 fig, 3 ref.

Descriptors: *Corrosion, Anodes, Cathodes, Electrolytes, Underground structures, Pipelines, Materials, *Metal pipes, Cost analysis, Rusting, Resistivity, *Soil chemistry, Soil properties.
Identifiers: *Electrolytic corrosion, Galvanic cells, *Galvanic corrosion, Ferrous pipelines.

The importance of the environment in the corrosion of buried pipe is emphasized in this discussion of soil types and properties, galvanic and electrolytic mechanisms of corrosion, and variations in pipeline materials and construction. The rate at which a material will corrode and the economics of appropriate corrosion control methods are important factors in the selection of construction materials. In an underground environment there are many types of soils with widely varying characteristics. Generally, the lower the resistivity of the soil, the more corrosive the environment. When metals are placed in soil, they corrode by two mechanisms: galvanic and electrolytic. Galvanic, probably the larger contributor, is a selfgenerating activity caused by environmental differences around or within the metal. In the electrolytic corrosion process current is forced to leave a buried metal structure that is in the vicinity of an electrified railway, streetcar, or highvoltage d-c electrical distribution system. The current flows onto the structure at some points (cathodic areas) but at other points (anodic areas), where the current leaves the structure, corrosion occurs. (Campbell-NWWA)
W73-11467

CATHODIC PROTECTION--THEORY AND PRACTICE IN THE WATER INDUSTRY,
Corrosion Engineers Ltd., Alresford, (England).
For primary bibliographic entry see Field 08A.
W73-11472

FOUR PHENOMENA AFFECTING CATHODIC PROTECTION AND CORROSION RATES,
Caproco Corrosion Prevention Ltd., Edmonton (Alberta).
F. W. Hewes.
Materials Protection, Vol 8, No 9, p 67-71, September, 1969. 6 fig, 6 tab, 10 ref.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, Underground structures, *Electro-osmosis, Electric currents, Resistivity, *Alternating currents, Anodes, Direct currents, Sulfur bacteria, Coatings.
Identifiers: Ground beds, *Current density (Electrical), Polarization.

The background and significance of (1) electro-osmosis, (2) coating holiday size, (3) a-c discharge, and (4) underfilm moisture are discussed. Electro-osmotic effects have a direct influence on the operation of ground beds and on certain phenomena at the protected cathode. The current density for a given driving voltage varies inversely with the holiday size. The smaller the holiday the greater the current density. Alternating current flow between a metal and an electrolyte does result in corrosion, although for steel and copper, the rate is only 0.1% of the corrosion that would theoretically be expected from the same d-c magnitude. While there can be areas in contact with moisture under a disbonded coating that are not reached by cathodic protection, the rate of corrosion at those areas the cathodic protection doesn't reach is under most conditions insignificant or definitely self-limiting. (Campbell-NWWA)
W73-11475

CATHODIC PROTECTION--THE ANSWER TO CORROSION PREVENTION OF UNDERGROUND STRUCTURES,
Hinchman Co., Detroit, Mich.
L. H. West.
Materials Protection, Vol 7, No 7, p 33-34, July, 1968. 2 fig, 2 ref.

Descriptors: Corrosion, Corrosion control, *Cathodic protection, Underground structures, Utilities, *Cost analysis, Economics, Graphical analysis, Pipes, Pipelines, Materials, Failures, Coatings, Construction, Pitting (Corrosion), *Design criteria.
Identifiers: Corrosion potentials.

Cathodic protection should be considered only as one portion of a corrosion control program. A brief guide for the comprehensive engineering of a corrosion program is presented. Included is discussion on failure repair, replacement, coating and cathodic protection, heavier wall thickness, changes in construction practices, ect. Two major classifications are presented, which require somewhat different considerations. These are (1) new construction and (2) existing structures. Proper application of cathodic protection to new construction should include a study of experiences of others in the same area, soil type, drainage, water table, and existing structures on the same site. Modifications to general construction practices can reduce total costs and make cathodic protection more practical. The same factors must be studied when cathodic protection is applied to existing structures. However, with existing structures, a history is generally available. Failure rate and pitting experience should be analyzed to give a true picture of past, present, and future conditions. (Campbell-NWWA)
W73-11477

PROCEDURE IMPROVED FOR DETERMINING CORROSION RATE BY WEIGHT LOSS,
Naval Civil Engineering Lab., Port Hueneme, Calif.
E. S. Matsui.
Materials Protection, Vol 7, No 7, p 31-32, July, 1968. 4 tab, 3 ref.

Descriptors: Corrosion, Corrosion control, *Materials testing, *Laboratory tests, *Statistical methods, Coatings, Preservation, Salts, Docks.
Identifiers: Salt spray, Ballast tanks, Preservatives.

During recent tests, a discrepancy was discovered in the procedure for salt spray testing provided in MIL-C-23050 (ships) for determining metal corrosion rate. The procedure did not consider nonhomogeneity of material among panels being tested. The standard test was conducted as follows: low carbon steel panels were sandblasted, weighed to .01 g, and coated with preservative approximately 1/8 inch thick. After being exposed for 15 days to 20% salt spray the panels were degreased with benzene, and acid-cleaned in inhibited 1.0 to 1.5 N hydrochloric acid at 83C. After cleaning, all panels were rinsed with distilled water, rinsed in acetone, and air dried. The dried panels were weighed to .01 g. The modified test method differs from the original method in one important respect. It uses the individual test specimen itself as a blank in order to reduce variation in weight losses when test panels from different batches are exposed to the same treatment during the acid cleaning procedure. (Smith-NWWA)
W73-11478

A LITERATURE SURVEY--PERFORMANCE OF EXCEPTIONAL METALS IN CORROSIVE ENVIRONMENTS,
National Association of Corrosion Engineers, Houston, Tex.
N. E. Hamner.

Materials Protection, Vol 6, No 10, p 31-39, October, 1967. 7 fig, 1 tab, 65 ref.

Descriptors: Corrosion, *Corrosion control, *Materials, Materials testing, *Metals, Metallurgy, Research and development, Research priorities, *Alloys, Abstracts, Beryllium, Titanium, Calcium, Boron, Cadmium, Cesium, Cobalt, Gold, Manganese, Mercury, Molybdenum.
Identifiers: Fuel cells, *High temperature applications, Atomic energy.

Among metals discussed are barium, beryllium, bismuth, cadmium, cesium, columbium, gallium, gold, hafnium, indium, iridium, lithium, manganese, molybdenum, plutonium, silver, tantalum, tungsten, and zirconium. Broad interest has been shown in these metals by scientists and engineers, as indicated by approximately 3480 abstract references reported by the author during 1965-1967. The reasons for the growing interest in these metals include the development of atomic energy for the production of electrical power, the growing development of high temperature systems, the need for molten metals (i.e., sodium) in primary circulating systems of atomic power systems, and the need for chlorine-resistant materials to be used in large-scale desalting-generating plants. Thermoelectric generators are also getting their share of attention in the hope that their efficiency can be increased both by design and material selection. The requirement for reliability in modern systems has opened the way for investigation of materials which a short time ago would not have been considered. (Smith-NWWA)
W73-11479

DESIGN AND INSTALLATION OF DEEP ANODE GROUNDBEDS,
Cathodic Protection Service, Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W73-11480

FLEXURAL FATIGUE STRENGTH OF STEEL FIBER REINFORCED CONCRETE BEAMS,
Clarkson Coll. of Technology, Potsdam, N.Y.
For primary bibliographic entry see Field 08F.
W73-11498

SIMPLIFIED COMPUTER APPROACH TO THE ULTIMATE LOAD ANALYSIS AND DESIGN OF REINFORCED CONCRETE FRAMES,
Indian Inst. of Tech., Madras.
For primary bibliographic entry see Field 08F.
W73-11499

ALL-POSITION PRODUCTION WELDING WITH FLUX-CORED GAS-SHIELDED ELECTRODES,
Meyer Industries, Inc., Red Wing, Minn.
For primary bibliographic entry see Field 08C.
W73-11501

STUDY OF THE BEHAVIOR OF A ROOF WITH VARIOUS BOLTING SYSTEMS,
For primary bibliographic entry see Field 08E.
W73-11503

BITUMINOUS BLANKET FOR DIKE AT LUDINGTON PUMPED STORAGE PROJECT,
Strabag Bau A.G., Cologne (West Germany).
For primary bibliographic entry see Field 08F.
W73-11504

A PROBABILISTIC APPROACH TO MAXIMUM COLUMN STRENGTH,
Lehigh Univ., Bethlehem, Pa.
For primary bibliographic entry see Field 08A.
W73-11516

NUMERICAL STATISTICS IN ENGINEERING GEOLOGY,
McGill Univ., Montreal (Quebec).
M. A. Muspratt.
Eng Geol Int J, Vol 6, No 2, p 67-78, Aug 1972. 4 fig, 2 tab, 8 ref.

Descriptors: *Statistics, *Settlement (Structural), Numerical analysis, Engineering geology, Systematics, Monte Carlo method, Stochastic processes, Regression analysis, Classifications, Mathematical models, Slope stability, Optimization, Foreign research.
Identifiers: Pile-driving formulas, Factor analysis, Pattern recognition, Statistical analysis, Mathematical analysis, Bearing capacity.

Statistical methods permit objective evaluation of detailed empirical and/or theoretical data and, therefore, permit rational decisions to be made. These methods are particularly relevant as complete, exact knowledge about nature is generally unavailable and deterministic description is impossible. Computer methods of solution are generally mandatory in view of the large quantities of information involved. Unfamiliarity with numerical tools, such as taxonomy, factorial analysis, pattern recognition, Monte Carlo simulation and its extensions, stochastic optimization, experimental design, and regression analysis seems to retard the use of statistical techniques in many branches of engineering geology. An example, using factor analysis, indicated that for a group of soil samples, particle size and bearing capacity are highly correlated, while unit weight and bearing capacity are not correlated. A pattern-recognition algorithm is described to facilitate automatic classification of data obtained from testing and instrumentation apparatus. Monte Carolo simulation is used to establish the probability distribution of the bearing capacity of a pile. Methods for analyzing settlement and other time-dependent phenomena are proposed. (USBR)
W73-11517

TORSIONAL STIFFNESS OF REINFORCED CONCRETE MEMBERS SUBJECTED TO PURE TORSION,
Chalmers Univ. of Technology, Goteborg (Sweden).
For primary bibliographic entry see Field 08F.
W73-11519

EXPANSION OF CYLINDRICAL PROBES IN COHESIVE SOILS,
Laboratoire Central des Ponts et Chaussees, Paris (France).
For primary bibliographic entry see Field 08D.
W73-11520

DESIGN, STRUCTURAL DETAILS, AND DISCONTINUITIES IN STEEL,
Lehigh Univ., Bethlehem, Pa.
J. W. Fisher, and B. T. Yen.
Paper, American Society of Civil Engineers, Spec Conf Safety Reliab Metal Struct, Pittsburgh, Pa, Nov 1972. 29 p, 27 fig, 18 ref.

Descriptors: *Fatigue (Mechanics), Fractures, Steel, Structural members, Structural design, *Defects, *Structural steel, Ultrasonics, Bibliographies, Structural engineering, Reliability, Materials, Safety, Welding, *Cracks, Stress.
Identifiers: *Fracture mechanics, Microcracks, Crack propagation, *Discontinuities.

To prevent fatigue and fracture of members and components of structures, material properties, fabrication procedures, loading conditions, design details, and applied stresses must be considered. Current design practices account for these factors in many ways and varying degrees of effectiveness. Systematic control against fracture has not been established, and fatigue control could be improved. Studies indicate discontinuities, ranging in size from microflaws to several inches, exist in almost all steel structural members, either from manufacture or from fabrication by rolling, welding, machining, or punching. Orientation of the discontinuity is a major factor in considering whether the defect will develop into a significant crack. Improper design of structural members can cause high stress concentrations, high magnitudes of stress range between fluctuating loads are responsible for fatigue crack growth from flaws. Briefly discussed are: (1) initial flaws and their orientation in structural members, (2) effect of structural details and stress magnitudes on fatigue cracking, (3) propagation of crack and brittle fracture, (4) effects of residual stresses, and (5) some design considerations. (USBR)
W73-11524

DESIGNING TO PREVENT BRITTLE FRACTURES IN BRIDGES,
Kansas Univ., Lawrence.
S. T. Rolfe.
Paper, American Society of Civil Engineers, Spec Conf Safety Reliab Metal Struct, Pittsburgh, Pa, Nov 1972. 42 p, 9 fig, 1 tab, 21 ref.

Descriptors: Structural design, *Bridge design, *Steel structures, Stress analysis, Failure (Mechanics), *Bridge failure, Bridges, Fabrication, Bibliographies, Fractures, Structural steel, High strength steel, Cracks, Welding, Welded joints.
Identifiers: *Fracture mechanics, Crack propagation, *Brittle fractures.

The service experience of bridge steels has been such that the designer seldom concerned himself with the notch-toughness of bridge steels. However, recent brittle fractures in bridges dictate that the designer become aware of available analytical methods to prevent brittle fractures. Three primary factors controlling likelihood of brittle fracture in a structure are: (1) material toughness (ability to deform plastically in the presence of a notch), (2) flaw size, and (3) tensile stress level. Of the different approaches to analyzing notch-toughness of structural steels, fracture mechanics is the most useful tool in designing to prevent fracture or fatigue failures in bridges. For structures subjected to fatigue loadings, initial cracks can grow during the life of the structure. A fracture control plan should be developed for complex welded structures, such as bridges, and should consider: (1) material selection, (2) material service temperature and loading rate, (3) structural design, (4) welding control, (5) fatigue crack growth, and (6) redundancy of the structure. Fracture mechanics concepts should be used to develop fracture control plans for other complex welded structures. (USBR)
W73-11525

DETERMINING THE STRENGTH OF CORRODED PIPE,
Texas Eastern Transmission Corp., Shreveport, La.
C. W. Marvin.
Mater Prot Performance, Vol 11, No 11, p 34-40, Nov 1972. 8 fig, 3 tab, 12 ref.

Descriptors: *Pipelines, *Corrosion, *Failure (Mechanics), *Steel pipes, Pressure tests, Rupturing, Hydrostatic pressure, Yield strength, Rusting, Safety, Strength of materials.
Identifiers: *Pipe tests, Corrosion fatigue, Fracture mechanics, Correlation, Destructive tests, Pitting, Surface properties, Test results, Material tests, Defects.

Recently the gas industry has attempted to resolve the problem of accurately determining the physical strength of corroded pipe. Better criteria for replacing corroded pipe can be established if the actual strengths can be determined from the geometry and material specificaations of the pipe.

During 1970-71, 47 full-scale instrumented hydrostatic pressure tests were conducted to determine the strength of corroded pipe which had been removed from service. Using the basic form of the NG-18 Surface Flaw Equation in the analysis, a formula was derived to analyze the strength of corroded pipe. Comparisons of predicted strength using the formula and actual failure strength of corrosion pits tested to rupture are presented. A variation of the research formula, simplified for field use in accepting or rejecting corroded pipe, is presented for maintaining safe pipeline operations. (USBR)
W73-11527

A MODEL FOR RAIN EROSION OF HOMEGENEOUS MATERIALS,
Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
G. S. Springer, and C. B. Baxi.
Available NTIS, Springfield, Va., 22151 as AD-748 790, Price $3.00 printed copy; $0.95 microfiche. Air Force Materials Laboratory Technical Report AFML-TR-72-106, June 1972. 53 p, 9 fig, 3 tab, 67 ref. AFC F33615-71-C-1572.

Descriptors: *Rainfall, *Drops (Fluids), *Materials testing, *Durability, Deterioration, Resistance, Aircraft, Turbine blades, Testing procedures, Mathematical studies, Equations, Data collections, Correlation analysis, Design criteria.

Aircraft components such as radomes, leading edge surfaces, helicopter blades, and various structural members may experience heavy damage when subjected to repeated impingements of rain droplets. Liquid droplets may also cause significant damage to steam turbine blades. Based on fatique theorems, a model is presented for describing both the incubation period, n (the time elapsed before the mass loss of the material becomes appreciable), and the mass loss after the incubation period, m. The parameters which govern the length of the incubation period and the subsequent mass loss rate are established. Simple algebraic expressions are developed to relate n and m to the properties of the impinging droplets and the material. The limits of applicability of the model are also established. The results agree with experimental data. (Woodard-USGS)
W73-11560

8H. Rapid Excavation

CONSTRUCTION DIFFICULTY INDEX FOR TUNNEL CONSTRUCTION,
Metropolitan Sanitary District of Greater Chicago, Ill.
S. J. Sulinski.
Presented at: Rapid Excavation and Tunneling Conference, American Society of Civil Engineers, New York, June, 5-7 1972. 19 p, 12 tab.

Descriptors: *Tunnels, *Tunneling, *Project planning, *Cost analysis, *Construction costs, Engineers estimate, Estimated costs, Illinois.
Identifiers: *Chicago.

The Metropolitan Sanitary District of Greater Chicago is making a continous study of tunnel construction costs as they relate to various construction parameters. This report analyzes the data from five such projects. Five machine-mined tunnels, all of which were in soft ground, involved the use of steel ribs and wood lagging. They had finished inside diameters of from 5 1/2 to 6 1/2 feet. The basic data recorded concerning progress per shift were: hours mined per shift, hours of downtime per shift, cause of downtime, soil profiles from soil borings and actual soil type mined. Data on manpower used and equipment type and condition were also noted. Mining progress was plotted upon soil profiles and data from the five contracts is summarized in this report. Mining rates were adjusted for different conditions and average rates were as follows: stiff, silty clay--7.0 feet per shift-hour, cohensive soils--5.0 feet per shift-hour, intermediate soils--4.0 feet an hour, and granular soils--3.0 feet an hour. Only where a high incidence of boulders is indicated do the rates need to be adjusted to account for boulder removal. Preconstruction planning was found to be extremely valuable and control of groundwater was found vital to the success of operation. Preliminary soil borings were found to be a valid basis for anitcipating conditions found during construction. Mining machines improvements are expected in the future. This is expected to increase speed and efficiency and lower costs. (Poertner)
W73-11681

8I. Fisheries Engineering

POLLUTION AS A RESULT OF FISH CULTURAL ACTIVITIES,
Utah State Div. of Wildlife Resources, Salt Lake City.
For primary bibliographic entry see Field 05B.
W73-11077

'BENDUVALA,' A SPECIAL GEAR FOR CATCHING MAJOR CARP LABEO FIMBRIATUS (BLOCH) IN GODAVARI RIVER, WITH OBSERVATIONS ON 'BENDUVALA' FISHERY AT DUMMAGUDEM,
Central Inland Fisheries Research Inst., Madras (India).
T. S. Ramaraju.
Proc Indian Acad Sci Sect B. Vol 74, No 6, p 277-283, 1971. Illus.
Identifiers: *Carp, Fishery gear, Godavari, India (Godavari River), Labeo-Fimbriatus, Rivers.

A short description of the net and its operation technique are given. Adverse effects of this equipment in the present fishery state of the river are also stressed.--Copyright 1972, Biological Abstracts, Inc.
W73-11405

SURVIVAL POTENTIAL OF F1 HYBRIDS AMONG SALMONID FISHES,
Freshwater Fisheries Research Lab., Tokyo (Japan).
R. Suzuki, and Y. Fukuda.
Bull Freshwater Fish Res Lab Tokyo, Vol 21, No 1, p 69-83, 1971, Illus.
Identifiers: Culture, Fishes (Hybrids), Ponds, *Salmonid fishes, Survival potential (Fish).

Artificial crosses in Salmonidae were carried out with 62 combinations. Survival rates in early stages of development were examined to obtain satisfactory F1 hybrids for pond culture and for stocking into lakes or rivers. Hybrid development did occur in all combinations, although there were wide differences in survival rates between combinations. Hybrids from 32 combinations survived until they reached the free-swimming stage and 9 of these showed survival rates similar to or better than those of parental species. The correlation between success of hybrid development and taxonomical position of parental species were discussed. In reciprocal crosses between species with small-sized eggs and species with large-sized eggs, survival rates were higher when eggs were from small-egg species than when eggs were from large-egg species.--Copyright 1972, Biological Abstracts, Inc.
W73-11653

09. MANPOWER, GRANTS AND FACILITIES

9B. Education (In-House)

SYSTEMS APPROACH TO TRAINING AND LICENSING OF WATER WORKS PERSONNEL IN ONTARIO,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05F.
W73-11676

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

A CATALOG OF HYDROCLIMATOLOGICAL DATA FOR ALASKA'S COASTAL ZONE,
Alaska University, College. Inst. of Water Resources.
For primary bibliographic entry see Field 02B.
W73-11056

THE GROWTH RATE OF ICE CRYSTALS: THE PROPERTIES OF CARBON DIOXIDE HYDRATE A REVIEW OF PROPERTIES OF 51 GAS HYDRATES,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 03A.
W73-11156

HOUSING AND PLANNING REFERENCES.
Department of Housing and Urban Development, Washington, D.C.
For primary bibliographic entry see Field 03D.
W73-11251

WATER ANALYSIS,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02K.
W73-11285

PHOSPHORUS REMOVAL, A BIBLIOGRAPHY, VOLUME I.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11319

PHOSPHORUS REMOVAL, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11320

ARTIFICIAL RECHARGE OF GROUNDWATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-11321

OPERATION OF THE ANALYTICAL METHODOLOGY INFORMATION CENTER,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05A.
W73-11336

ENVIRONMENTAL TERMINOLOGY INDEX.
Oak Ridge National Lab., Tenn. Environmental Information Systems Office.

Report ORNL-EIS-72-22 (2 volumes), November 1972 (preliminary edition). Vol I-232 p, 57 ref; Vol II-115 p, 57 ref. AEC W-7405-eng-26.

Descriptors: *Environment, *Thesauri, *Indexing, *Physiological ecology, Natural resources, Publications, Documentation, Technology, Technical writing, Abstracts, Ecology, Social aspects, Biology, Information retrieval.
Identifiers: *Earth sciences thesaurus, Terminology, Index.

In 1971, information meetings of the International Biological Program illustrated the urgent need for worldwide communication on practical as well as basic environmental problems. As a result this Environmental Terminology Index or Thesaurus was written as a contribution of the USA. The index includes terms in areas of physical sciences, technology, earth sciences, social sciences, biology, and ecology. To serve as a tool in information retrieval, keywords are chosen to indicate information and data content of a piece of literature or a file of numbers. A semantic definition may be provided in the thesaurus by means of scope notes or the structure which is given to the terminology. The embedded hierarchy (volume I) displays main terms, listed alphabetically, with any associated scope notes, preferences, and cross-references. A heirarchical structure is incorporated among the narrower terms for each main term. Preferred terms identify the choices made between closely related or ambiguous terms. Terms included in hierarchical structures identify the relation between descriptors at different levels of specificity. Related terms show the variety of other relationships that may exist between terms. The permuted index (volume II) displays main terms, listed alphabetically, with any associated scope notes, preferences, and cross-references. (Woodard-USGS)
W73-11387

10D. Specialized Information Center Services

OPERATION OF THE ANALYTICAL METHODOLOGY INFORMATION CENTER,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05A.
W73-11336

10F. Preparation of Reviews

STATE-OF-THE-ART REVIEW OF PULP AND PAPER WASTE TREATMENT,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 05D.
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WATER ANALYSIS,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02K.
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A LITERATURE SURVEY--PERFORMANCE OF EXCEPTIONAL METALS IN CORROSIVE ENVIRONMENTS,
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For primary bibliographic entry see Field 08G.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 19
OCTOBER 1, 1973

W73-11701 -- W73-12350

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 19
OCTOBER 1, 1973

W73-11701 -- W73-12350

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
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SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

BOUND WATER IN DISPERSE SYSTEMS (SVYAZANNAYA VODA V DISPERSNYKH SISTEMAKH).
Moscow State Univ. (USSR).

Izdatel'stvo Moskovskogo Gosudarstvennogo Universiteta, V. F. Kiselev, and V. I. Kvlividze, editors, Moscow, 1970. 168 p.

Descriptors: *Bound water, *Dispersion, *Water properties, Water structure, Molecular structure, Hydrogen bonding, Films, Ions, Ice, Cations, Cation exchange, Aqueous solutions, Clay minerals, Rocks, Crystals, Infrared radiation, Analytical techniques, Spectroscopy, Nuclear magnetic resonance, Electrochemistry, Zeta potential, Equations.
Identifiers: *Disperse systems, *Adsorbed water.

The mechanism and properties of water adsorbed on the surface of disperse systems are examined. Problems confronting geologists in the study of bound water are discussed, and investigations are made of complex heterogeneous processes in bonding materials, using infrared spectroscopy, nuclear magnetic resonance, and electrochemical methods. (Josefson-USGS)
W73-11857

DAMPING THE ENERGY OF SURFACE WAVES BY TURBULENCE (GASHENIYE ENERGII POVERKHNOSTNYKH VOLN TURBULENTNOST'YU),
Moscow State Univ. (USSR).
G. Ye. Kononkova, and K. V. Pokazeyev.
Meteorologiya i Gidrologiya, No 8, p 91-93, August 1972. 1 fig, 2 ref.

Descriptors: *Waves (Water), *Surfaces, *Energy, *Turbulence, Turbulent flow, Mixing, Wavelengths, Equations.

The interaction of wave motion on a water surface and turbulent flow in a surface layer is examined. A decrease in the energy of wave motion results from the mixing of particles having the greatest energy of orbital motion with particles having the least energy. An expression is obtained for the damping coefficient, i.e., the decrease in wave energy as a function of the turbulence spectrum. (Josefson-USGS)
W73-12057

EFFECT OF MULTIPLE SCATTERING ON RADIANT ENERGY TRANSFER IN WATERS,
Purdue Univ., Lafayette, Ind. Heat Transfer Lab.
R. Viskanta, and J. S. Toor.
Journal of Geophysical Research, Vol 78, No 18, p 3538-3551, June 20, 1973. 11 fig, 2 tab, 23 ref.

Descriptors: Solar radiation, Water temperature, Optical properties, Light penetration, Reflectance, Turbidity, Heat balance, Heat budget, Variability, Mathematical models.
Identifiers: ScatteringOptical.

The local radiative flux and the volumetric rate of absorption of solar radiation in water may be calculated on spectral and total bases. The model considers absorption, multiple scattering, internal reflection of radiation at the air-water interface, and reflection at the bottom. Numerical results are given for pure water with isotropic, Rayleigh, forward, and experimental scattering and other physical parameters on radiant energy transfer in waters. Models which ignore scattered energy can lead to serious errors in the predictions of the radiative flux and the volumetric rate of solar energy absorption. It is unrealistic to use an arbitrary mean value of the absorption or attenuation coefficient for predicting radiative transfer in waters. Knapp-USGS
W73-12080

1B. Aqueous Solutions and Suspensions

THE INFLUENCE OF SURFACES ON THE STRUCTURE OF WATER,
North American Rockwell Corp., Canoga Park, Calif.
M. Kirsch, and W. V. Johnston.
Available from the National Technical Information Service as PB-218 560, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Research and Development Progress Reports No 837, December 1972. 19 p, 1 tab, 1 fig. 14-30-2914.

Descriptors: *Thermodynamics, *Molecular structure, *Membranes, *Water properties, *Water structure, Physiocochemical properties, *Surfaces.
Identifiers: Differential scanning calorimetry, Solute rejection.

A combination of adsorption and calorimetric measurements was made to study structuring of water at cellulose acetate surface of varying polarity. In this work cellulose acetate powders with varying degrees of acetylation were used. The results obtained support experimental evidence from diverse sources of a relation between solvent structuring at interfaces and solute rejection. (OSW)
W73-11754

DIRECT OBSERVATION OF REVERSIBLE FORMATION OF ANIONIC SIGMA COMPLEXES RELATED TO TRANSITION STATE ANALOGS FOR ADENOSINE DEAMINASE,
Georgia Inst. of Tech., Atlanta. School of Chemistry.
C. L. Liotta, and A. Abidaud.
Journal of the American Chemical Society, Vol 94, p 7927-7928, 1972. 2 fig, 10 ref. OWRR B-049-GA (4). NSF Grant GP 14437.

Descriptors: *Water chemistry, *Chemical reactions, *Organic compounds, Nitrogen, Carbon, Oxygen, Alcohols, Enzymes.
Identifiers: Purine analogs, Tetrahedral carbon, Anionic complexes, Reversible formation.

Adenosine deaminase has been reported to catalyze the hydrolysis of nitrogen, halogen, oxygen, and sulfur leaving groups located at the 6 position of purine ribonucleosides. Evidence has been presented which indicates that the mechanism involves nucleophilic substitution of water or enzyme-bound eater on the purine nucleus proceeding via a tetrahedral intermediate. Purine analogs were prepared with tetrahedral carbon at C-6 via photochemical addition of methyl alcohol to purine ribonucleoside and have shown that these act as powerful enzyme inhibitors. The first direct observation of the reversible formation of purine analogs with tetrahedral carbon at C-6 via a nucleophilic addition mechanism, and the first observable sigma anionic complexes not stabilized by nitro groups are described. (Woodard-USGS)
W73-11852

EFFECT OF MULTIPLE SCATTERING ON RADIANT ENERGY TRANSFER IN WATERS,
Purdue Univ., Lafayette, Ind. Heat Transfer Lab.
For primary bibliographic entry see Field 01A.
W73-12080

02. WATER CYCLE

2A. General

FORMATION AND COMPUTATION OF COMPONENTS IN A RIVER REGIME (FORMIROVANIYE I RASCHETY ELEMENTOV REZHIMA REK).
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, Kaganer, M. S., editor, Moscow, 1972. 144p.

Descriptors: *Rivers, *Rainfall-runoff relationships, *Flood discharge, *Storm runoff, *Surface-groundwater relationships, Hydrographs, Discharge (Water), Sediment discharge, Mudflows, Avalanches, Landslides, Karst, Tributaries, Mountains, Flood forecasting, Probability, Precipitation gages, Seasonal, Mathematical studies, Equations.
Identifiers: *Ukraine, *Carpathians, Storm precipitation, Travel time, Rain-gage networks, Nomograms.

Precipitation, flood discharge, and mudflows in the Ukrainian Carpathians are discussed in this collection of 11 papers published by the Ukrainian Hydrometeorological Scientific Research Institute. A method was developed for forecasting great storm floods on mountain tributaries of the Dniester River based on precipitation, and a study was made of the influence of karst on formation of components in a hydrologic regimen. Results are presented of investigations of suspended-sediment discharge in rivers of the Ukraine and of subsurface flow in rivers in lowland regions of the Dniester basin. (See also W73-11826 thru W73-11834) (Josefson-USGS)
W73-11825

A QUANTITATIVE RELATIONSHIP BETWEEN SURFACE AND SUBSURFACE COMPONENTS IN THE TOTAL FLOOD DISCHARGE OF RIVERS IN WESTERN AND CENTRAL PODOLIA (O KOLICHESTVENNOM SOOTNOSHENII MEZHDU PODZEMNOY I POVERKHNOSTNOY SOSTAVLYAYUSHCHIMI V SUM MARNOM STOKE PAVODKOV NA PRIMERE REK ZAPADNOY I TSENTRAL'NOY PODOLII),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
N. V. Tsupko.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 131-135, Moscow, 1972. 2 fig, 4 tab, 3 ref.

Descriptors: *Surface-groundwater relationships, *Surface runoff, *Subsurface runoff, *Flood discharge, *Rivers, Floods, Rainfall-runoff relationships, Storm runoff, Karst, Hydrographs, Correlation analysis, Equations.
Identifiers: *Ukraine, Podolia.

Quantitative relations between surface and subsurface components of storm floods on rivers in western and central Podolia were investigated. Because of the influence of karst, large amounts of groundwater are present in flood discharges. An analysis is made of approximately 400 floods, observed between 1946 and 1968 and caused by rainfall of varying intensity and duration on rivers with drainage areas ranging in size from 100 to 300 sq km. A very weak relation is observed between the volume of the storm flood and the flood-producing precipitation. For western Podolia, the coefficient of correlation is 0.67 and for central Podolia, 0.47.

Parameters of the relation of subsurface runoff to total flood discharge are determined by the least squares method and solved by digital computer. (See also W73-11825) (Josefson-USGS)
W73-11834

ON THE GROUND-WATER DISCHARGE TO THE BALTIC SEA AND METHODS FOR ESTIMATING IT,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 02F.
W73-11843

WATER-BUDGET STUDIES OF LOWER MESILLA VALLEY AND EL PASO VALLEY, EL PASO COUNTY, TEXAS.,
Geological Survey, El Paso, Tex.
W. R. Meyer, and J. D. Gordon.
Geological Survey open-file report, June 1973. 43 p, 3 fig, 13 tab, 3 ref.

Descriptors: *Water balance, *Hydrologic budget, *Texas, Rainfall, Evaporation, Recharge, Water storage, Groundwater resources, Discharge (Water), Phreatophytes, Consumptive use, Evapotranspiration.
Identifiers: Mesilla Valley (Tex), El Paso Valley (Tex).

The total inflow of water to the lower Mesilla Valley, El Paso County, Texas, in 1970 was 390,510 acre-feet. Of this amount, 41,300 acre-feet was consumptively used by crops and phreatophytes, and 4,700 acre-feet lost by evaporation. Groundwater storage increased by 320 acre-feet, and 360,860 acre-feet left the valley as surface water and groundwater outflow. Groundwater recharge was approximately 26,170 acre-feet. The total inflow to the lower Mesilla Valley in 1971 was 282,880 acre-feet, of which 41,800 acre-feet was consumptively used by crops and phreatophytes, and 4,500 acre-feet was lost by evaporation. Groundwater storage decreased by 3,970 acre-feet and 244,320 acre-feet left the valley as surface water and groundwater outflow. Groundwater recharge was approximately 33,500 acre-feet. The average yearly inflow to the El Paso Valley in 1968-71 was 301,770 acre-feet. The average consumptive use by irrigated crops and phreatophytes was 138,870 acre-feet; the average evaporation loss was 27,000 acre-feet; the average change in groundwater storage was a decrease of 3,225 acre-feet; and the average outflow from the valley was 96,640 acre-feet. Groundwater recharge averaged about 80,710 acre-feet. (Knapp-USGS)
W73-12022

SIMULATION OF HYDROLOGIC AND CHEMICAL-QUALITY VARIATIONS IN AN IRRIGATED STREAM-AQUIFER SYSTEM--A PRELIMINARY REPORT,
Geological Survey, Denver, Colo.
L. F. Konikow, and J. D. Bredehoeft.
Colorado Water Resources Circular No 17, 1973. 43 p, 24 fig, 23 ref.

Descriptors: *Hydrologic data, *Groundwater, *Rivers, *Water quality, *Colorado, Irrigation, Aquifer characteristics, Water wells, Withdrawal, Water yield, Groundwater recharge, Computer models, Hydrology, Basic data collections, Correlation analysis, Hydrologic budget, Streamflow, Semiarid climates.
Identifiers: *Arkansas River Valley (Southeast Colo).

Salinity increases in groundwater and surface water in the Arkansas River Valley of southeaster Colorado are primarily related to irrigation practices. A digital-computer model was developed to predict changes in dissolved-solids concentration in response to spatially and temporally varying stresses. The equations which describe the transient flow of groundwater and the transport and dispersion of dissolved chemical constituents were solved numerically. The model was used to simulate the flow as well as the changes in water quality for both the stream and the aquifer. A 1-year period during which detailed field measurements had been made in an 11-mile reach of the valley between La Junta and the Bent-Otero County line was used to verify and calibrate the model. Calculated water table elevations in the aquifer were within 1 foot of the observed values approximately 90% of the time, and calculated dissolved-solids concentrations were within 10% of the observed values for both the aquifer and the stream approximately 80% of the time. (Woodard-USGS)
W73-12024

SUMMARY REPORT ON THE UPPER BEAR CREEK EXPERIMENTAL PROJECT.
Tennessee Valley Authority, Knoxville. Div. of Water Control Planning.

Hydraulic Data Branch Cooperative Report, January 1973. 43 p, 7 fig, 1 tab, 1 append.

Descriptors: *Water resources development, *Streamflow, *Water quality, *Model studies, Methodology, Planning, Land use, Hydrologic data, Groundwater movement, Simulation analysis, Watershed management, Storms, Hydrographs, Forecasting.

Two mathematical models, one a continous daily-streamflow model, the other a storm-hydrograph model, are described; they were developed for use inplanning water resources. The parameters of each model are related to watershed characteristics so that they can be applied where data are available. The two models were designed to be used separately or in combination to provide information for a wide range of planning applications. Tests of the models indicate they can be used to extend short term stream gage records, to simulate water quality constituent transport, in research watershed studies, in flood studies, and in evaluating the impact upon the water resource of land use changes. The watersheds used to calibrate the models sample a limited range of available conditions; still, these techniques promise to provide the ability to simulate water quantity and quality under past, present, or proposed land use at any point such information may be needed. (Woodard-USGS)
W73-12026

WATER BALANCE OF WORLD CONTINENTS AND BALANCE ESTIMATE OF WORLD FRESHWATER RESOURCES (VODNYY BALANS MATERIKOV ZEMNOGO SHARA I BALANSOVAYA OTSENKA MIROVYKH RESURSOV PRESNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
M. I. L'vovich.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 5, p 5-20, September-October 1972. 6 fig, 5 tab, 50 ref.

Descriptors: *Water balance, *Water resources, *Freshwater, *Estimating, Hydrologic cycle, Precipitation (Atmospheric), Evaporation, Runoff, Surface runoff, Subsurface runoff, Subsurface flow, Streamflow, Soil moisture, Lakes, Reservoirs, Water supply, Hydrologic data, Curves, Maps, Equations.
Identifiers: *Continents, *Global hydrology, Icecaps.

Results are presented of many years of investigation of water balance of continents and world freshwater resources. Through use of interpolation relationships to compensate for data gaps, maps are compiled for basic items in the world water balance: total runoff (including surface and subsurface components); total moisture; evaporation; and the coefficient of subsurface flow to streams, which reflects much of the stable component of streamflow. Revised estimates are made of water-balance items and freshwater resources for the continents and for the USSR. Per-capita freshwater supply to continents is calculated, and a table presents data on both subsurface flow to streams and lake- and reservoir-regulated runoff for each continent. (Josefson-USGS)
W73-12054

HYDROLOGY OF THE PACIFIC OCEAN (GIDROLOGIYA TIKHOGO OKEANA).
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02L.
W73-12063

HYDROLOGIC CHANGES AFTER CLEAR-CUT LOGGING IN A SMALL OREGON COASTAL WATERSHED,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 04C.
W73-12066

APPLICATION OF THE SOURCE-AREA CONCEPT OF STORM RUNOFF TO A SMALL ARIZONA WATERSHED,
Geological Survey, Menlo Park, Calif.
F. E. Arteaga, and S. E. Rantz.
Journal of Research, U.S. Geological Survey, Vol 1, No 4, p 493-498, July-August 1973. 5 fig, 3 tab, 5 ref.

Descriptors: *Storm runoff, *Rainfall-runoff relationships, Arizona, Antecedent precipitation, Precipitation intensity, Infiltration, Unit hydrographs, Hydrograph analysis, Peak discharge.
Identifiers: Source-area (Runoff).

The source-area concept of storm runoff was demonstrated by analysis of the rainfall-runoff relation for the watershed of Queen Creek tributary in south-central Arizona. Simplifying assumptions were needed to eliminate some of the many basin variables of unknown magnitude. The percentage of watershed contributing storm runoff was related to total rainfall received on the assumption that the availability of rainfall excess from any subarea was dependent on the saturation, or near saturation, of a permeable upper layer of soil. An average unit hydrograph was used for all computed sizes of the runoff-contributing area. (Knapp-USGS)
W73-12067

UNCERTAINTIES IN ESTIMATING RUNOFF--PRODUCING RAINFALL FOR THUNDERSTORM RAINFALL-RUNOFF MODELS,
Agricultural Research Service, Tucson, Arizona. Southwest Watershed Research Center.
H. B. Osborn, W. C. Mills, and L. J. Lane.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 189-202, 1972. 3 fig, 5 tab, 8 ref.

Descriptors: Hydrology, *Rainfall-runoff relationships, *Thunderstorms, *Stochastic processes, *Estimating, Watersheds (Basins), Value, Accuracy, Data collections, Air masses, *Risks, *Arizona.
Identifiers: *Walnut Gulch Watershed (Ariz) Error.

Using records from a 95-rain-gage network, a stochastic model of air-mass (regional) thunderstorm rainfall is being developed for use in a runoff prediction model for arid land watersheds. Records from the 57-square-mile USDA-ARS Walnut Gulch Experimental Watershed in southeastern Arizona indicate that thunderstorm

rainfall fits the definition of a stochastic process accurately. A runoff prediction model based on a stochastic input (thunderstorm rainfall) and a deterministic watershed response produces a stochastic output (runoff). The validity of the runoff model depends upon the accuracy and certainity of the input and watershed response models. The uncertainties in the stochastic rainfall model are examined and the effects of these uncertainties on the stochastic output are investigated, assuming that the deterministic watershed response model is without error. Sampling errors and effects of simplification are carried through the process and compared with observed variability in actual data. (See also W73-12269) (Bell-Cornell)
W73-12282

REDUCTION OF UNCERTAINTIES IN AUTOCORRELATION BY THE USE OF PHYSICAL MODELS,
Geological Survey, Washington, D.C.
M. E. Moss.
In: Proceedings (Vol I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 203-229, 1972. 7 fig, 1 tab, 15 ref.

Descriptors: Hydrology, *Streamflow, *Annual, *Groundwater, *Base flow, *Model studies, Aquifers, Precipitation, Estimating, Stochastic processes, Infiltration, Runoff, Equations, Systems analysis, *Risk.
Identifiers: *Autocorrelation coefficients, Linear relationships.

Estimates are discussed of autocorrelation coefficients for the stationary annual streamflow series. The water year can be defined as starting with any arbitrary date in the year. The various definitions yield different autocorrelation structures for the resulting annual stream-flow series. Under the assumptions of a linear aquifer and serially independent annual precipitations, each of these series can be approximated by a mixed-autoregressive-moving-average (ARMA) process. The autocorrelation coefficients of the annual streamflow series are functions of the basin parameters and the seasonality of the precipitation regime. Sample autocorrelation in the 50-year realizations of precipitation can drastically modify the apparent autocorrelation structure of the annual streamflow sequence. The effects of the 'correlated' precipitation can be avoided by making use of the ARMA estimates of autocorrelation. The uncertainties of the small sample estimates of the autocorrelation function of streamflow may thus be reduced by the use of physical properties of the basin in its definition. (See also W73-12269) (Bell-Cornell)
W73-12283

TESTS OF STATIONARITY OF HYDROLOGIC TIME SERIES,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
L. Torelli, and V. T. Chow.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 254-272, 1972. 5 fig, 1 tab, 3 ref.

Descriptors: *Mathematical models, Hydrology, *Time series analysis, *Stochastic processes, Hydrologic data, Average, Temperature, Precipitation, Streamflow, Equations, Systems analysis.
Identifiers: *Stationary-embedded processes.

Identification is discussed of mathematical models for hydrologic time series, particularly of monthly values of the following types: Monthly average temperatures, monthly average precipitations, and monthly streamflows. In the analysis of such monthly hydrologic time series the first step is to define a general class of stochastic processes to which the time series under analysis may belong. Commonly taken into consideration is the class of weakly stationary processes. These processes are commonly used as a hydrologic model because a vast body of theoretical knowledge concerning both the probability structure of such processes (e.g., spectral analysis, Wold theorem), and their statistics (e. g., correlogram, spectral estimates, and relative distributions and properties) are available to the analyst. Based on physical considerations a more general class of stochastic processes is needed in order to provide a suitable model for the hydrologic time series. Stationarity-embedded processes are discussed in detail. The class of weakly stationary processes is a subclass of this class of stationarity-embedded processes. The data can be analyzed to determine if the series are stationary or stationarity-embedded nonstationary. None of the series in the analysis is found to be stationary, although they can be stationarized by dividing each value by the corresponding monthly standard deviation. (See also W73-12269) (Bell-Cornell)
W73-12286

VARIABILITY OF THE SOIL WATER FLOW PARAMETERS AND THEIR EFFECT ON THE COMPUTATION OF RAINFALL EXCESS AND RUNOFF,
Agricultural Research Service, University Park, Pa. Northwest Watershed Research Center.
For primary bibliographic entry see Field 02G.
W73-12291

2B. Precipitation

DESIGN CHARACTERISTICS OF STORM PRECIPITATION IN THE CARPATHIANS (RASCHETNYYE KHARAKTERISTIKI DOZHDEVYKH OSADKOV V KARPATAKH),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
P. M. Lyutik, Ye. N. Kiptenko, and V. T. Bedratenko.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 19-32, Moscow, 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Precipitation (Atmospheric), *Rainfall, *Storms, *Mountains, *Depth-area-duration analysis, River basins, Floods, Correlation analysis, Variability, Probability, Frequency curves, Equations.
Identifiers: *Carpathians, *Storm precipitation.

Precipitation data for 1891-1970 were used to determine maximum daily precipitation probability in river basins of the Carpathians. Probability curves of maximum daily precipitation and coefficients of variation and asymmetry were determined by graphical correlation. The coefficients of variation of maximum daily precipitation range from 0.27 to 0.68. Highest values (0.40-0.68) are observed in upper reaches of the Prut, Bystritsa Nadvornyanskaya, Bystritsa Solotvinskaya, Lomnitsa, Svicha, and Stryy River basins, and lowest values (0.32-0.43) are confined to rivers in Transcarpathia. The coefficient of asymmetry varies between 0.30 and 6.00. Greatest maximum daily precipitation of 1% probability (150-200 mm) occurs in the Ciscarpathians and in the central part of the northeastern Carpathians, while the smallest (80-120 mm) is observed in the Zakarpatskaya lowland. Graphs were constructed to show the relation of maximum daily precipitation to rainfall depths of 1% probability. Observed figures of maximum rainfall for various durations (5, 10, 20, 40, 60, 90, 150, 300, 720, 1,440, and 2,880 min) for all years of observation were used. The data obtained can be used to compute rainfall amounts and their corresponding average intensities for various durations at given probabilities of exceedance. (See also W73-11825) (Josefson-USGS)
W73-11827

POSSIBILITY OF USING STORAGE PRECIPITATION GAGES TO IMPROVE THE ACCURACY OF PRECIPITATION DATA IN THE UKRAINIAN CARPATHIANS (O VOZMOZHNOSTI UTOCHNENIYA KOLICHESTVA OSADKOV V UKRAINSKIKH KARPATAKH PO DANNYM SUMMARNYKH OSADKOMEROV),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
M. M. Ayzenberg, and M. L. Vol'ftsun.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 33-39, Moscow, 1972. 3 fig, 2 tab, 11 ref.

Descriptors: *Precipitation (Atmospheric), Precipitation gages, *Mountains, Orography, River basins, Gaging stations, Rainfall disposition, Areal, Mudflows, Measurement, Correlation analysis, Curves, Seasonal.
Identifiers: *Ukraine, *Carpathians, Rain-gage networks.

The relatively dense rainfall-gage network in the Carpathians, concentrated mainly in low mountain areas at the bottoms of river valleys, should be improved to yield a more accurate picture of the areal distribution of precipitation. The Tret'yakov precipitation gages, which are used for precipitation measurement, given only point-rainfall values. To measure precipitation in mountainous areas, storage gages should be used to catch and store precipitation for periods of 30 days or more. Precipitation data obtained from storage gages during the warm season of the year are comparable to the data obtained from Tret'yakov gages installed at closely spaced meteorological stations. The presence of a network of storage gages will make it possible to record the maximum amount of precipitation occurring in mountains and will provide a basis for computing correction factors for the precipitation measured at valley gage locations. (See also W73-11825) (Josefson-USGS)
W73-11828

A COMPREHENSIVE ANALYSIS OF A MAJOR STORM AND ASSOCIATED FLOODING IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. B. Thorud, and P. F. Ffolliott.
Arizona Agricultural Experiment Station, Technical Bulletin 202. May 1973 30 p. 8 tab., 18 fig., 51 ref. OWRR A-999 Ariz (2)

Descriptors: *Storms, *Floods, *Thunderstorms, *Damages, *Excessive precipitation, Rainfall intensity, Peak discharge, Forecasting, Runoff, Depth-area-duration analysis, Meteorological data, Hydrologic data, Surveys, *Arizona.

The meteorological and hydrological event known as the 1970 Labor Day Storm in Arizona caused more loss of human life than any other storm in Arizona's recent history, as well as damage to property by record flooding. The meteorological analysis of this event is documented through examination of the synoptic features, total storm rainfall, rainfall intensity, and the return period. The hydrological analyses cover peak flows and recurrent intervals, upland watershed damages, relation to land management practices, and forecasts and warnings. Losses, damages, and expenditures are detailed. A generalized and integrating analysis of the characteristics associated with these recurring storms, is recommended, so that design and safety information can be disseminated in those areas of the state where storms of tropical origin seem to have the greatest impact. Despite the loss of life and natural resources, the 1970 flood did cause increased storage in surface water reservoirs,

probably increased groundwater supplies, and created through channel scour and clearing stream conditions that subsequently improved runoff and resulted in less transmission loss of the water resource. Included are recommendations for improvements in analysis of this type of phenomenon. (Paylore-Arizona)
W73-12242

WATER-STRESS PATTERNS IN HONEY MESQUITE,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 02I.
W73-12252

STOCHASTIC MODELS FOR PRECIPITATION,
Metropolitan State Coll., Denver, Colo. Dept. of Mathematics.
R. A. Crovelli.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 284-298, 1972. 5 fig 7 ref.

Descriptors: Hydrology, *Stochastic processes, *Precipitation, *Storms, *Markov processes, Meteorological data, Time, Costs, Pumping, Mathematical models, Systems analysis.

Stochastic models for the meteorological precipitation process are considered. Finite continuous-time Markov chain theory is used to model the precipitation process. A new theorem dealing with the limiting state probabilities of finite continuous-time Markov chains is presented. The theorem shows that the limiting state probabilites are a simple function of the transition-rate matrix. Time-to transition precipitation models for the distributions of the random variables storm duration and time between storms are discussed. Several continuous-time precipitation models are studied. The expected total amount of precipitation of the process as a function of time is obtained. Precipitation dependent systems are also analyzed and illustrated. (See also W73-12269) (Bell-Cornell)
W73-12287

UNCERTAINTIES IN POINT AND AREAL SAMPLING OF PRECIPITATION AND THEIR IMPORTANCE IN HYDROLOGIC COMPUTATIONS,
Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development.
C. A.Phanartzis, and C. C. Kisiel.
In: Proceedings, (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 341-357, 1972. 5 fig, 2 tab, 10 ref.

Descriptors: *Sampling, *Areal, *Precipitation, *Watersheds (Basins), *Hydrology, Altitude, Mountains, Seasonal, Storms, Estimating, Mathematical models, Systems analysis, *Risks, *California.
Identifiers: Point sampling, *Cyprus, *San Dimas Experimental Forest.

The uncertainty in sampling point and areal precipitation in some small mountain watersheds in the San Dimas Experimental Forest in Southern California and in a moderate sized mountain watershed in Cyprus is examined. For the Cyprus watershed the uncertainity resulting from the spatial variability and lumping of precipitation to obtain areal estimates of same is also compared for different sampling intervals (day, month, year). The effect of altitude on precipitation amounts in the San Dimas Experimental Forest is presented in the form of a precipitation-altitude relationship which was derived earlier for a small mountain watershed with very steep slopes. The transferability of this relationship was tested by applying it to storms in a small neighboring watershed; the results are presented and discussed. Errors, due to transferring, in estimating areal precipitation, are evaluated from a watershed modeling point of view. These errors may be partly attributed to the uncertainty arising from ignorance about nature concerning precipitation-altitude-gradient relationships. The danger of transferring watershed parameters even in almost identical watersheds, when the precipitation input to the model is underlain by uncertainty, is demonstrated by using actual examples from Cyprus. (See also W73-12269) (Bell-Cornell)
W73-12290

THE DESIGN OF OPTIMAL PRECIPITATION MEASURING NETWORKS FOR FLOOD FORECASTING,
Enviro-Engineers Ltd., Cincinnati, Ohio.
W. M. Grayman, and P. S. Eagleson.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 379-394, 1972. 6 fig, 7 ref.
Identifiers: *Susquehanna River.

In the design of any information gathering system, the ultimate use of this information should be considered; the design process should include the designation of relevant objectives, the accounting of all benefits and costs attributed to the objectives, and the selection of the system that maximizes some weighted combination of net benefits. This study analyzes a precipitation measuring network in terms of a single objective–maximization of net national income–and a single purpose, i.e. use of the measurements in a flood warning system. A flexible computer-based simulation model has been developed to determine the net benefits associated with a network. Model results suggest that such networks are feasible for a wide range of economic and hydrologic situations. Furthermore raingage networks result in higher net benefits than do combined radar-raingage systems for all situations tested. The feasibility of the use of economic analysis in evaluating precipitation measuring networks is demonstrated. The optimal density of raingages depends on the level of economic development in a region, the frequency and severity of floods, and the accuracy of the measuring instruments. Application of this model to an actual river basin is demonstrated through a case study of the West Branch of the Susquehanna River. (See also W73-12269) (Bell-Cornell)
W73-12292

SPACE-TIME UNCERTAINTIES IN PRECIPITATION MEASUREMENT,
Illinois State Water Survey, Urbana.
F. A. Huff, and P. T. Schickedanz.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 395-409, 1972. 3 fig, 5 tab, 10 ref.

Descriptors: *Precipitation, Measurement, *Rain gages, *Networks, *Climatic data, *Hydrology, *Illinois, Estimating, Analytical techniques, Hydrologic data, Storms, Seasonal, *Risks.
Identifiers: *Space-time, Errors.

Research results are presented, based primarily upon data from Illinois dense raingage networks used to assess space-time uncertainties in precipitation measurements under midwestern U.S. climatic conditions. Measurements for time periods ranging from one minute through total storm, monthly, and seasonal periods have been studied on networks of 10 to 600 square miles, with emphasis on needs in weather modification evaluations. Uncertainties have been evaluated for the time-period data stratified by precipitation type, synoptic storm type, and season. The cost of installing and maintaining dense networks of size appreciably greater than 600 square miles is often prohibitive, but measurements on much larger areas are frequently required to meet hydrologic, climatic and weather modification needs. Therefore, techniques have been developed to estimate measurement errors in areas of limited data coverage and in different climatic regimes by applying knowledge accumulated from the network studies. Required space density and time measurement period for specified levels of precision can be calculated for any given sampling area with the developed techniques through use of climatic data for the region of interest. (See also W73-12269) (Bell-Cornell)
W73-12293

PRECIPITATION PROBABILITIES FOR KENTUCKY,
Kentucky Agricultural Experiment Station, Lexington.
A. B. Elam, Jr., C. T. Haan, B. J. Barfield, and T. C. Bridges.
Available from NTIS Springfield, Va 22151 as COM-73-10286 Price $3.00 printed copy; $1.45 microfiche. Progress Report 202, December 1972. 56 p, 15 fig, 2 tab, 11 ref, 2 append.

Descriptors: *Precipitation (Atmospheric), *Meteorological data, *Kentucky, *Rainfall, Forecasting, Methodology, Rainfall disposition, Rainfall intensity, Probability.
Identifiers: *Precipitation probabilities (Ky).

The probabilities of receiving specified amounts of precipitation are presented for 1-, 2-, and 3-week periods at 25 locations in or near Kentucky. Information is given on the source of the data, method of analysis, and Kentucky precipitation patterns. The period of record chosen was January 1932 through June 1969. Data tables show the mean precipitation for the 1-, 2-, and 3-week periods and the probabilities of receiving a specified amount or more of precipitation for these periods. Examples of how to use tables are included. Annual precipitation in Kentucky ranges from about 50 inches to the south and to about 38 inches in the north. The larger amounts in the south reflect the lesser distance from the Gulf of Mexico, the prime source of moisture for Kentucky precipitation. The warmer months of June, July, and August present a pattern with the maximum precipitation tending to occur in the central and/or eastern portions of the state. The remaining months show little or no pattern. (Woodard-USGS)
W73-12304

2C. Snow, Ice, and Frost

ICEFIELD RANGES RESEARCH PROJECT SCIENTIFIC RESULTS, VOLUME 3.

American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, V. C. Bushnell, and R. H. Ragle, editors, 1972. 261 p.

Descriptors: *Glaciers, *Glaciology, *Glaciohydrology, Canada, Movement, Flow, Regimen, Geomorphology, Vegetation effects, Sedimentology, Permafrost, Remote sensing.
Identifiers: Icefield ranges (Canada), St. Elias Mountains (Canada), Yukon Territory.

The studies reported in volume 3 of the Icefield Ranges Research Project fall into three general categories: (1) those related to surging-glacier research; (2) topics of general interest in the physical sciences; and (3) topics of general interest in the biological sciences. Included in the first category are studies of the Steele Glacier, which

surged in 1965-1968, and studies of the Rusty Glacier, which is believed to be in a presurge phase. Geomorphology, structures of braided streams, permafrost, frost action, supraglacial streams, moraines, hydrogeology, and remote sensing are among the specific topics discussed. (See W73-11791 thru W73-11809) (Knapp-USGS)
W73-11790

STEELE GLACIER, 1935-1968,
American Geographical Society, New York.
W. A. Wood.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 1-8, 1972. 9 fig, 8 ref.

Descriptors: *Glaciers, *Canada, *Regimen, *Flow, Mapping surveys, Aerial photography, Photography, Glaciology.
Identifiers: *Icefield Ranges (Canada), *Surging glaciers, *Steele Glacier (Canada).

Steele Glacier is about 35 km long and rarely more than 2.5 km wide. It is one of many ice streams which drain the northeastern slopes of the St. Elias Mountains in Canada. From an appraisal of 1960 photography, Steele Glacier was evaluated as being in a state of imminent surge. Movement of the ice was measured, and a daily rate of 15 m was established. By August 1968 the surge appeared to have run its course. The zone of contact between active ice of the surge and stagnant debris-covered ice of the last advance showed little change from the August 1967 stand. The chaotic texture of the surface, so dramatic in 1966, had been replaced by softened lines and angles. (See also W73-11790) (Knapp-USGS)
W73-11791

MOVEMENT OBSERVATIONS ON THE TERMINUS AREA OF THE STEELE GLACIER, JULY 1967,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
S. Thomson.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal Canada, p 29-37, 1972. 12 fig, 1 tab, 3 ref.

Descriptors: *Glaciers, *Canada, *Regimen, *Sediment transport, *Flow, Surveys, Sediments, Glaciology, Glacial drift, Rheology, Till.
Identifiers: *Icefield Ranges (Canada), *Surging glaciers, *Steele Glacier (Canada).

An expedition on the Steele Glacier, Canada, from July 10-24, 1967, studied the effects of a surging glacier on the formation of glacial deposits and observed the means of incorporating debris into the ice mass. A part of this study consisted of measurements of the movement of the active ice mass and the reactivation of dead ice. During the first few days, rates of movement were approximately 0.4 ft/hr, but by the end of the observation period the motion had slowed to less than half this value. The portion of the dead ice being reactivated had rates of movement of the same order of magnitude. The dead ice appears to be reactivated by the generation of a series of shear planes, some of which rise from the ground surface through the entire ice mass. Suggested mechanisms for incorporation of debris into the ice mass are motion on shear planes and overriding of superglacial debris on the dead ice. (See also W73-11790) (Knapp-USGS)
W73-11792

COMPARISON OF MORAINES FORMED BY SURGING AND NORMAL GLACIERS,
Geological Survey of Canada, Calgary (Alberta).
N. W. Rutter.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 39-46, 1972. 8 fig, 2 tab, 18 ref.

Descriptors: *Glaciers, *Flow, *Montana, *Glacial drift, *Sedimentary structure, Petrofabrics, Till, Geomorphology, Stratigraphy.
Identifiers: *Bighorn Glacier (Mont), *Grizzly Glacier (Yukon), Surging glaciers.

A neoglacial moraine of Bighorn Glacier, St. Elias Mountains, probably formed by a surging glacier, and a neoglacial normal moraine of nearby Grizzly Glacier were studied. Surficial deposits and erosional features were mapped. Fabric analyses were done in till at five sites in each moraine. Samples were subjected to laboratory lithologic and texture analyses. The Bighorn (surge) moraine is a thin, discontinuous, irregular mantle, mostly till, but including ice-contact stratified material. Lateral moraines show subdued ridges marking the upper limit of glaciation. Ground moraine of the Grizzly (normal) glacier is an irregular, continuous, thick mantle, mostly till and ice-contact stratified material. Upper ice limits are marked by prominent ridges. Rocks of similar lithologies within the till are concentrated in bands parallel to glacier flow. Stones in till of the Grizzly moraine have strong preferred orientation roughly in the direction of glacier flow. In the Bighorn morain, rocks in till are weakly oriented. Where orientation is apparent, it is not necessarily in the flow direction. For the size fraction finer than 2 mm, Bighorn till is coarser than Grizzly till although the bedrock terrain is similar. These differences are useful in distinguishing moraines of normal and surging glaciers. (See also W73-11790) (Knapp-USGS)
W73-11793

SOME ASPECTS OF THE GEOMORPHOLOGY OF MELTWATER STREAMS, STEELE GLACIER TERMINUS,
Alberta Univ., Edmonton. Dept. of Geology.
A. J. Broscoe.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 47-51, 1972. 2 fig, 3 tab, 1 ref.

Descriptors: *Sediment load, *Water chemistry, *Glaciohydrology, *Geomorphology, *Suspended load, *Bed load, Sediment transport, Alluvial channels, Glacial drift, Discharge (Water), Sediment yield.
Identifiers: *Steele Glacier (Canada).

The geomorphology of the headwaters of Steele Creek, which originates at the terminus of the Steele Glacier, Yukon Territory, is described. Two channels drain from the glacier. The smaller channel to the north had a discharge in July of about 2.3 cu m/sec adjacent to the glacier, and a suspended sediment load of about 4.5 kg/sec. The bed load included boulders. At a distance of 1400 m from the front of the glacier, the channel had a discharge of 4.87 cu m/sec and a suspended load of about 9 kg/sec. The main channel had a discharge of about 49.3 cu m/sec and a sediment load of about 63 kg/sec. Bed load transport was strongly effective in the main channel. The chemical composition of the water indicates that the two forks of Steele Creek have separate sources under the glacier. Material is being eroded mainly from the channel floors rather than removed from the glacier directly. The sediment in suspension contains high percentages of sand which is very angular and consists of quartz plus small fragments of the local bedrock. (See also W73-11790) (Knapp-USGS)
W73-11794

OBSERVATIONS ON AN ALPINE MUDFLOW, STEELE CREEK,
Alberta Univ., Edmonton. Dept. of Geology.
A. J. Broscoe, and S. Thomson.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 53-60, 1972. 7 fig, 2 tab, 13 ref.

Descriptors: *Mudflows, *Glaciohydrology, *Glacial drift, *Sediment transport, Alpine, Canada, Mass wasting, Sedimentation, Erosion, Sedimentology, Till, Particle size.
Identifiers: *Steele Creek (Canada).

Alpine mudflows occurred on the ridges above Steele Creek, St. Elias Mountains, Yukon Territory, on July 11, 1967, during a rainfall of 2.19 inches in 36 hours. One flow was observed in an area of flat-topped, steep-sided morainal terraces on the lower part of the north valley wall. This mudflow emerged in pulses from a notch at the upper margin of the terrace surface, and formed fronts 6 to 8 ft high. The arcuate fronts broke either to the east or west, and the mud flowed across the fan and through erosional notches to the valley floor. A detailed map and profiles show the topography and distribution of materials. The stream deposited coarse bed load on the alluvial fan on the upper terrace, then cascaded down the notch. Undercutting of the notch caused periodic collapse of the morainal material, which formed temporary dams. Water and finer bed load were impounded and the dam was saturated but not overtopped. Saturated material emerged from the notch as viscous, rock-charged mud. Particles in the mudflow ranged in size from colloids to boulders 13 ft across. Pebbles from a mudflow sample included 70% locally derived lava and 18% granite from the moraine. Material finer than 2 microns was predominantly monmorillonite. Rain and runoff washed fine material from mudflow deposits, leaving the lag deposit similar to alluvial gravel. Botanical evidence indicates that mudflows occur at intervals of decades. The collapse of material from the sides of the steep-walled, high-gradient notch, cut into easily erodable till, controlled the pulsating nature of the observed mudflow. (See also W73-11790) (Knapp-USGS)
W73-11795

OBSERVATIONS OF THE SURGE OF STEELE GLACIER,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
A. D. Stanley.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 61-69, 1972. 4 fig, 2 tab, 22 ref.

Descriptors: *Glaciers, *Canada, *Regimen, *Flow, Mapping surveys, Aerial photography, Photography, Glaciology.
Identifiers: *Icefield Ranges (Canada), *Surging glaciers, *Steele Glacier (Canada).

For part of 1966, Steele Glacier in the Icefield Ranges, Yukon Territory, made a spectacular advance at a rate exceeding 500 m per month. The main part of the surge continued for two years, but by early 1968 the advance had slowed to less than one tenth of the maximum rate. For most of the 35-km length of the main trunk the surface was a chaotic jumble of ice blocks, spires, and pinnacles, but large structures outlined by surface moraine were preserved. Most of these structures had been displaced 8 km by August 1967, irrespective of their original location. Structures were displaced similar distances down the length of the glacier; most of the glacier moved forward as a block. The surge has not been correlated with any local earthquake activity, and there is no evidence for a short term climatic change. The movement resulted from critical dynamic conditions within the glacier, possibly facilitated by increased amounts of water along the ice-bedrock contact. (See also W73-11790) (Knapp-USGS)
W73-11796

THE ICE-DAM, POWDER-FLOW THEORY OF GLACIER SURGE,
Monsanto Co., St. Louis, Mo.
L. E. Nielsen.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 71-74, 1972. 6 fig, 8 ref.

Descriptors: *Glaciers, *Flow, *Rheology, Mudflows, Landslides, Movement, Freezing, Melt water, Glaciohydrology, Regimen.
Identifiers: *Surging glaciers, *Powder flow.

To explain surging glaciers, this theory assumes that a stagnant iceblock or dam develops in the lower regions. Ice gradually builds up above the dam while the dam itself becomes thinner by ablation. Eventually the upper end of the stagnant iceblock crumbles from the force of the ice above it, and much of the glacier is changed from a state of compression to one of tension. The breaking of the ice dam results in the glacier rapidly becoming broken into a mass of blocks or powdered ice. The apparent viscosity of the broken-up glacier is much less than that of bulk ice, so high velocities of flow are possible, and a phenomenon similar to a mudflow results. This theory explains why some glaciers repeatedly surge yet appear stagnant between surges. The broken-up appearance of surging glaciers and the delayed surging of tributaries are explained. Additional substantiating observations on several of these phenomena are presented. (See also W73-11790) (Knapp-USGS)
W73-11797

A TWO-YEAR MASS-BALANCE STUDY OF THE RUSTY GLACIER, 1968-1969,
Boston Univ., Mass. Dept. of Geology.
T. Brewer.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 75-82, 1972. 5 fig, 2 tab, 11 ref.

Descriptors: *Glaciers, Water balance, *Regimen, Flow, Snowfall, Canada, Ablation, Glaciology, Sampling.
Identifiers: *Surging glaciers, *Rusty Glacier (Canada), *Mass balance.

Rusty Glacier is a small valley glacier in Yukon Territory with a history of glacial surging. A mass-balance study was carried out on Rusty Glacier during 1968 and 1969. The 1968 mass balance was (+) 6,000 million kg of water, while the 1969 balance was (-) 1,590 million kg. This yields a two-year balance of (-) 990 million kg. Statistical examination of the data indicates that this two-year result is reliable to +44%. The distribution of snow in 1968 confirms the presence of a bedrock hump under the ice predicted from gravity measurements. The five-year mass balance (1967-1971) may be negative, and about 1,000 million kg. (See also W73-11790) (Knapp-USGS)
W73-11798

HYDROLOGICAL STUDY OF THE RUSTY GLACIER,
Vrije Universiteit, Amsterdam (Netherlands). Instituut voor Aardwetenschappen.
T. Faber.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 83-92, 1972. 6 fig, 13 tab, 6 ref.

Descriptors: *Glaciohydrology, *Glaciers, *Water balance, Water yield, Canada, Ablation, Discharge (Water), Melt water, Regimen, Glaciology.
Identifiers: *Rusty Glacier (Canada), *Surging glaciers, Mass balance.

The Rusty Glacier is probably in a presurge phase. It and two other glaciers, the Trapridge and the Backe, occupy a common basin in the St. Elias Mountains, Yukon Territory. Hydrological data from the basin as a whole and from each of the individual glaciers were gathered during the period July 9-August 15, 1968. During this period the total discharge from the basin was 6.9 million cu m. Rusty Glacier contributed 24% of this discharge; the other two glaciers together contributed 52%; and the ice-free part of the basin contributed 12%. The contribution of the Rusty Glacier to the total discharge is distinctly lower than that of the other glaciers. The low discharge from the Rusty Glacier is in accordance with the expectation that this glacier will surge. Statistical formulas are given for the relationship of discharge to temperature and to precipitation. The calcium content of both the water and its suspended sediment in the discharge near the exit of the basin is mainly due to the calcium content of the discharge from a Trapridge Glacier stream which flows across moraine containing limestone fragments. (See also W73-11790) (Knapp-USGS)
W73-11799

GRAVITY AND SHALLOW-ICE TEMPERATURE MEASUREMENTS ON THE RUSTY GLACIER,
British Columbia Univ., Vancouver. Dept. of Geophysics.
D. J. Crossley, and G. K. C. Clarke.
In: Icefield Ranges Research Project Scientific Results, Vol 3. American Geographical Society, New York, N Y, and Arctic Institute of North America, Montreal, Canada, p 93-101, 1972. 3 fig, 1 tab, 18 ref, 2 append.

Descriptors: *Glaciers, *Gravity studies, *Temperature, Surveys, Canada, Movement, Flow, Sounding.
Identifiers: *Rusty Glacier (Canada), *Surging glaciers.

The Rusty Glacier, Yukon Territory, has a history of surging but is at present quiescent. In 1968 a gravity survey indicated the glacier has a maximum depth of 88 m. Near-surface temperature measurements identify the Rusty as a subpolar glacier. Depth profiles across the glacier show no unusual bedrock features. (See also W73-11790) (Knapp-USGS)
W73-11800

THERMAL DRILLING AND ICE-TEMPERATURE MEASUREMENTS IN THE RUSTY GLACIER,
British Columbia Univ., Vancouver. Dept. of Geophysics.
D. F. Classen, and G. K. C. Clarke.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 103-116, 1972. 4 fig, 5 tab, 32 ref, 2 append.

Descriptors: *Glaciers, *Geothermal studies, *Heat flow, *Temperature, Melting, Movement, Drilling, Sampling, Borehole geophysics.
Identifiers: *Rusty Glacier (Canada), *Surging glaciers.

During the summer of 1969 a thermal rilling and deep-ice temperature measurement program was carried out on the Rusty Glacier, Yukon Territory. The thermal drilling produced seven instrumented holes at six locations on the glacier, three reaching bedrock. The glacier was below the pressure-melting point throughout, and there is evidence of a disturbed thermal regime. Geothermal heat flow had an anomalous value of 4.73 microcal per sq cm sec. Bottom temperature models indicate the possibility of basal melting. (See also W73-11790) (Knapp-USGS)
W73-11801

ABUNDANCES OF ISOTOPIC SPECIES OF WATER IN THE ST. ELIAS MOUNTAINS,
Alberta Univ., Edmonton.
K. E. West, and H. R. Krouse.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 117-130, 1972. 21 fig, 4 tab, 22 ref.

Descriptors: *Oxygen isotopes, *Water balance, *Glaciohydrology, Tracers, Stable isotopes, Movement, Glaciers, Canada, Snowfall.
Identifiers: *St. Elias Mountains (Canada), *Surging glaciers.

Snow and ice samples were collected from the St. Elias Mountains in the Yukon Territory during the summers of 1968 and 1969. The collection sites included Mt. Logan (elevations up to 5800 m), Divide (the accumulation area of the Hubbard and Kaskawulsh Glaciers), and Rusty Glacier (a glacier with possible surging properties). The 0-18 values varied from -4.51% (SMOW) on Mt. Logan, elevation 5,860 m, to -14.8% (SMOW) at the Rusty Glacier, in rainfall at 2,460 m elevation. The 0-18/0-16 data elucidated complex weather patterns caused by the St. Elias Mountains acting as an obstacle to easterly flow, as well as giving insight into the flow pattern of the Rusty Glacier. (See also W73-11790) (Knapp-USGS)
W73-11802

SNOW ACCUMULATION IN THE ICEFIELD RANGES, ST. ELIAS MOUNTAINS,
Michigan Univ., Ann Arbor. Dept. of Geography.
M. G. Marcus, and R. H. Ragle.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 131-142, 1972. 7 fig, 2 tab, 46 ref, 2 append.

Descriptors: *Snowfall, *Snowpacks, *Water balance, Water yield, Canada, Alpine, Snow surveys, Climatology.
Identifiers: *St. Elias Mountains (Canada), *Icefield Ranges (Canada).

Snowpack characteristics in the St. Elias Mountains were examined as part of the Icefield Ranges Project for 1961-1965, emphasizing particularly the 1964-1965 glacier balance year, together with reconstructions for 1953-1961. Analysis was carried out along a hydrological traverse on the Kaskawulsh, Hubbard, and Seaward-Malaspina Glaciers, and at a single location through a period of time. The data obtained are summarized in graphs and tables. The relationships between precipitation, elevation, and topography, and effects of continentality and exposure are considered. In no case are the relationships clearly defined, but it is evident that elevation is a critical factor in the maintenance of continental slope glaciers and spring runoff. Fluctuations in net accumulation were determined and evaluated; a stable period is indicated for the late 1950's, followed by an increase of 200 to 300 mm in the early 1960's and a minimum in 1964-1965 and 1965-1966 of winter nourishment and mass balance. (See also W73-11790) (Knapp-USGS)
W73-11803

THE EFFECTS OF A SUBARCTIC GLACIER ON RADIO-WAVE PROPAGATION IN SUMMER,
University of Electro-Communications, Tokyo (Japan).
T. Yoshino.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 143-152, 1972. 24 fig, 6 ref.

Descriptors: *Glaciers, *Remote sensing, *Radio waves, Electrical studies, Air temperature, Snow, Ice, Glaciology, Radar, Instrumentation.

The attenuation of radio waves reflected on a glacier surface and propagation loss through ice were measured. Reflection coefficients were determined over a range of air temperatures. In summer, the air temperature a short distance above the snow and ice surface of a Subarctic glacier rises above 0 deg C during a warm day. The reflection coefficient during such a warm day exceeds 0.4, and drops below 0.1 during a cold night; the average value of the coefficient is 0.35. These reflection coefficients at MF and HF ranges are less than those of any other ground surface except the Antarctic and Greenland ice sheets. The dielectric constant of glacier ice for air temperatures was measured from -15 deg C to 0 deg C. A simple method of calculating dielectric constants for a known temperature is given. (See also W73-11790) (Knapp-USGS)
W73-11804

SUPRAGLACIAL STREAMS OF THE KASKAWULSH GLACIER,
Michigan Univ., Ann Arbor. Dept. of Geography.
K. J. Ewing.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 153-162, 1972. 10 fig, 9 ref.

Descriptors: *Glaciohydrology, *Glaciers, *Melt water, *Channel morphology, Streamflow, Temperature, Weather, Melting, Ablation, Geomorphology.
Identifiers: *Supraglacial streams, *Kaskawulsh Glacier (Canada).

Two general categories of supraglacier streams were identified during the summers of 1965 and 1966 on the Kaskawulsh Glacier, Yukon Territory: (1) annual streams having shallow channels, and (2) perennial streams having deeper channels which are reused from year to year. Perennial channels had depths of one meter or more; they were generally parallel to the glacier flow, and were often regularly spaced across the glacier. The dynamic factors, climate and glacier movement, are particularly important to the formation of supraglacial streams, in addition to the static factors of relief, structure, and gradient. Daily maximums and minimums in stream discharge lagged behind daily maximum and minimum temperatures. This lag increased downstream. Glacier movement changes stream gradient, the realigning of stream patterns, and the elongation of stream pattern. Ice type, presence of crevasses, type of relief, and the presence of surface debris all contributed to the nature and volume of the streams. (See also W73-11790) (Knapp-USGS)
W73-11805

PATTERNS OF SURFACE TEMPERATURE IN THE ALPINE/PERIGLACIAL ENVIRONMENT AS DETERMINED BY RADIOMETRIC MEASUREMENTS,
State Univ. Coll., Geneseo, N.Y. Dept. of Geography.
R. Lougeay.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 163-176, 1972. 12 fig, 6 tab, 10 ref.

Descriptors: *Remote sensing, *Glaciers, *Infrared radiation, *Temperature, Solar radiation, Ice, Snow, Soil, Talus, Glacial drift, Photometry.
Identifiers: Radiometry, St. Elias Mountains (Canada).

Observations were conducted in the St. Elias Mountains, Yukon Territory, to determine the applicability of thermal remote sensing in the alpine and periglacial environments. Techniques of obtaining ground observations were tested by which the usefulness of infrared scanning can be determined without the expense of airborne sensing on a trial and error basis. An attempt was also made to determine the effects of changing meteorologic conditions on both actual and radiometric temperatures of several terrain surfaces. These surfaces include various types of ice-cored moraine, glacial ice, and morainic outwash at the terminal margins of a large valley glacier. Temperatures obtained radiometrically were directly linked to insolation, which is in turn a function of cloud cover and atmospheric transmissivity. When comparing radiometric temperatures with the various components of the energy balance over an environmental surface, trends in radiometric temperature closely mirrored trends of net radiation at the surface, as expected. The techniques appear useful in predicting the best time for thermal remote sensing overflight, and in indicating the intensity of ground observations needed at that time. (See also W73-11790) (Knapp-USGS)
W73-11806

UP-HEAVED BLOCKS: A CURIOUS FEATURE OF INSTABILITY IN THE TUNDRA,
Portland State Univ., Oreg. Dept. of Geography.
L. W. Price.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 177-181, 1972. 2 fig, 15 ref.

Descriptors: *Tundra, *Solifluction, *Geomorphology, *Frost heaving, *Frost action, Arctic, Canada, Heaving, Ice, Frozen soils, Permafrost.
Identifiers: Ruby Range (Canada), Frost-heaved blocks.

Up-heaved blocks occurring in unconsolidated material on well-vegetated slopes in the Ruby Range, Yukon Territory, were investigated. These are very similar in appearance to the frost-thrust blocks which normally occur on level, poorly vegetated, bedrock areas. The up-heaved blocks in the study area are one to three feet high and show evidence of recent activity. Freshly overturned turf around the bases of some of the blocks suggest that they may have been thrust above the surface by considerable force. Annual movement is only one to two inches. Origin of these features is a result of several processes. Diurnal freeze and thaw is important for two or three weeks in the spring when a narrowly thawed zone surrounding the block allows the development of frost pressure within a semi-closed system. The annual freeze in the fall contributes about one-fourth inch to the upheaval of the blocks, and solifluction is important during the summer. The size and shape of blocks, as well as local site conditions, govern the occurrence of these features which are striking evidence of the instability that characterizes the tundra. (See also W73-11790) (Knapp-USGS)
W73-11807

VEGETATION, MICROTOPOGRAPHY, AND DEPTH OF ACTIVE LAYER ON DIFFERENT EXPOSURES IN SUBARCTIC ALPINE TUNDRA,
Portland State Univ., Oreg. Dept. of Geography.
For primary bibliographic entry see Field 02J.
W73-11809

FORECASTING RUNOFF FROM UNIVERSAL SURFACE GAGE SNOWMELT MEASUREMENTS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
L. M. Cox, and J. F. Zuzel.
Journal of Soil and Water Conservation, Vol 28, No 3, p 131-134, May-June 1973. 6 fig, 1 tab, 5 ref.

Descriptors: *Snowmelt, *Water yield, *Runoff forecasting, Statistical methods, Correlation analysis, Melting, Thawing, Snow surveys, Antecedent precipitation, Gages, Snowpacks.

Many daily rates of snowmelt runoff depend strongly on antecedent snowmelt and runoff. The method of least squares, coupled with an accumulation procedure, produces high correlations between accumulated runoff and accumulated snowmelt. It is possible, therefore, to forecast both mean daily flows and daily volume for a basin during a snowmelt event. This method also appears useful for extended runoff forecasts based on the amount of snow remaining at a snow-course sampling site. These extended forecasts can be made with greater accuracy than 1-day forecasts. The universal gage is especially suited for making short-term forecasts because it gives information on both daily snowmelt and water equivalent values. This information can be used for making daily predictions as well as extended forecasts. Both the daily snowmelt and water equivalent measurements are easily adapted to telemetering systems to obtain information from remote sites. (Knapp-USGS)
W73-11853

THERMAL REGIME OF FREEZING BODIES OF WATER (TERMIKA ZAMERZAYUSHCHIKH VODOYEMOV),
A. A. Pivovarov.
Izdatel'stvo Moskovskogo Gosudarstvennogo Universiteta, Moscow, 1972. 140 p.

Descriptors: *Temperature, *Heat balance, *Heat flow, *Freezing, *Bodies of water, Rivers, Lakes, Reservoirs, Ice, Ice cover, Crystallization, Cooling, Heating, Melting, Radiation, Turbulence, Mixing, Depth, Seasonal, Equations.
Identifiers: Heat exchange.

A physicomathematical description is given of temperature changes and ice conditions in rivers, lakes, and reservoirs. Items in the heat balance of water bodies are examined together with summer warming and autumnal cooling, temperature regime of water under ice, growth and decay of ice cover, and dynamics of ice processes in open water. Theoretical methods are reduced to working formulas suitable for practical use and compared with field data. (Josefson-USGS)
W73-11858

INVESTIGATION OF EFFECT OF SOIL FREEZING DEPTH AND OTHER FACTORS ON SNOWMELT RUNOFF ON RIVERS IN STEPPE AND FOREST-STEPPE ZONES (ISSLEDOVANIYE VLIYANIYA GLUBINY PROMERZANIYA POCHVY I DRUGIKH FAKTOROV NA TALYY STOK REK STEPNOY I LESOSTEPNOY ZON),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-12055

ABSORPTION OF SOLAR RADIATION BY MELTING ICE COVER ON RIVERS AND RESERVOIRS (K VOPROSU O POGLOSHCHENII SOLNECHNOY RADIATSII TAYUSHCHIM LEDYANYM POKROVOM REK I VODOKHRANILISHCH),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
V. M. Timchenko.
Meteorologiya i Gidrologiya, No 8, p 97-98, August 1972. 1 fig, 3 ref.

Descriptors: *Ice cover, *Solar radiation, *Absorption, *Rivers, *Reservoirs, Melting, Ice, Spring, Measurement, Curves, Equations.
Identifiers: *European USSR, *Ussuri River.

An empirical equation adopted at the USSR Hydrometeorological Center for calculating absorption of solar radiation by melting ice cover on rivers and reservoirs in European Russia was applied to ice cover on the Ussuri River near Kirvoskiy in the Soviet Far East in spring seasons of 1970-71. The absorption curve obtained is characteristic of ice cover on rivers and reservoirs of the Maritime Territory and, possibly, of the entire Amur River basin. (Josefson-USGS)
W73-12058

AT INSTITUTES OF THE HYDROMETEOROLOGICAL SERVICE (V UCHREZHDENIYAKH GIDROMETSLUZHBY),
G. N. Khmaladze.
Meteorologiya i Gidrologiya, No 8, p 120-121, August 1972.

Descriptors: *Conferences, *Glaciers, *Snow cover, *Snowpacks, *Avalanches, Snowmelt, Mudflows, Synoptic analysis, Gravimetric analysis, Photogrammetry, Satellites (Artificial), Forecasting.
Identifiers: *Caucasus.

The Fifth Transcaucasian Scientific Conference was held in Baku, March 27-30, 1972, to study snow cover, snowpacks, snow avalanches, and glaciers in the Caucasus. Organized by the Transcaucasian Ice and Snow Commission of the Transcaucasian Hydrometeorological Scientific Research Institute, the conference was attended by over 100 delegates from various planning agencies and scientific research institutes in Tbilisi, Baku, and Yerevan. The problems discussed in the 50 papers of the conference included: (1) areal distribution of snow cover and snow avalanches in the Caucasus; (2) effect of synoptic processes on evolution of snow cover; (3) use of satellite data to improve methods for studying snow cover, avalanches, and glaciers; and (4) methods for computing and forecasting snowmelt-glacier runoff and avalanche hazards, methods of snow-avalanche control, etc. Problems relating to thermal conditions in alpine glacial basins, glacier conditions in the northern Caucasus, and gravimetric and stereophotogrammetric methods of glacier and glacial-mudflow investigations were discussed in about 30 papers devoted to glacier studies in the Caucasus. (Josefson-USGS)
W73-12059

MICROWAVE SIGNATURES OF FIRST-YEAR AND MULTIYEAR SEA ICE,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 07B.
W73-12081

ATTENUATION OF SWELL BY SEA ICE,
Scott Polar Research Inst., Cambridge (England).
P. Wadhams.
Journal of Geophysical Research, Vol 78, No 18, p 3552-3563, June 20, 1973. 12 fig, 1 tab, 23 ref.

Descriptors: *Waves (Water), *Sea ice, *Rheology, *Ocean waves, Deformation, Strain, Elastic theory.
Identifiers: Wave attenuation.

A mechanism of steady-state creep is proposed to describe the attenuation rate of long-period ocean waves in fields of sea ice. This mechanism fits observations, provided a Glen-type flow law is employed with an exponent n±3 and a flow law parameter (B) similar to the value for polycrystalline ice near the melting point. (Knapp-USGS)
W73-12082

EDDY CORRELATION MEASUREMENTS OF EVAPORATION AND SENSIBLE HEAT FLUX OVER ARCTIC SEA ICE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 02D.
W73-12083

SEASONAL REGIME AND HYDROLOGICAL SIGNIFICANCE OF STREAM ICINGS IN CENTRAL ALASKA,
D. L. Kane, and C. W. Slaughter.
Paper presented at International Symposia on the Role of Snow and Ice in Hydrology, UNESCO-Session 5, September 6-13, 1972, Banff, Canada. 14 p, 5 fig, 1 tab, 16 ref.

Descriptors: *Ice, *Streams, *Rivers, *Alaska, Arctic, Permafrost, Base flow, Melt water, Water storage.
Identifiers: *Icings, *Naleds.

Stream icings were monitored near the outlets of three subdrainages of the Caribou-Poker Creeks Research Watershed, north of Fairbanks, Alaska. The icings constituted 4% of yearly runoff volume, but amounted to nearly 40% of winter streamflow. Melt occurred over a four-week period, largely following ablation of the seasonal snowpack. Icings indicate sources of subsurface water yield. Icings are a means of water storage and delayed water yield during the ablation season. The influenc on water yield from upland basins is primarily in terms of timing. Icings persist long after disappearance of snow cover. In the absence of precipitation, melt of this stored ice constitutes the major addition to base flow of upland streams following melt of the snowpack. During the spring, the presence of these ice masses in valleys causes diversion of meltwater from single-channel streamflow to dispersed flow. Channels develop (or are maintained during icing formation) under and in the ice mass, as well as on the surface. (Knapp-USGS)
W73-12314

2D. Evaporation and Transpiration

EDDY CORRELATION MEASUREMENTS OF EVAPORATION AND SENSIBLE HEAT FLUX OVER ARCTIC SEA ICE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
M. R. Thorpe, E. G. Banke, and S. D. Smith.
Journal of Geophysical Research, Vol 78, No 18, p 3573-3584, June 20, 1973. 10 fig, 2 tab, 18 ref.

Descriptors: *Sea ice, *Heat flow, *Evaporation, *Heat budget, Solar radiation, Heat transfer, Advection, Convection, Radiation, Mass transfer, Remote sensing, Instrumentation.

A sonic anemometer, lyman alpha humidiometer, and thermistor thermometer were operated on ice at 75N, 150W in March-April 1972 as part of the Aidjex pilot study. Spectra of temperature and humidity fluctuations and cospectra for the sensible and latent heat fluxes were similar to those for neutral conditions over sea and land. Bulk transfer coefficients were CT±0.0012 and CO±0.00055. The Bowen ratio of sensible to latent heat fluxes ranges from 1 to 15 and can be obtained from values of the temperature and humidity spectra at low frequencies except when the latent heat flux is very small. These data were recorded at the spring equinox, and the dominant feature of the heat fluxes is their diurnal variation. Evaporation continued for several hours after the sensible heat flux changed to the downward direction. Over Robeson Channel in July 1972 the heat transfer coefficient was CT-0.001 for stable conditions. (Knapp-USGS)
W73-12083

2E. Streamflow and Runoff

STATISTICS OF OCEAN WAVE GROUPS,
Amoco Production Co., Tulsa, Okla.
K. G. Nolte, and F. H. Hsu.
Society of Petroleum Engineers Journal, Vol 13, No 3, p 139-146, June 1973. 9 fig, 4 ref, 2 append.

Descriptors: *Waves (Water), *Statistics, *Ocean waves, Statistical methods, Frequency, Time series analysis.
Identifiers: Wave forces (Ships).

The occurrence probability was calculated for the number and height of consecutive waves which are large compared with the average wave height. Such wave groups can create extreme forces in mooring lines of large vessels. All the parameters that describe the statistics of wave groups can be derived from the energy spectrum representing the sea state if the energy spectrum is assumed to contain only a narrow band of wave frequencies. Good agreement was found between the theoretical expressions and actual wave data. (Knapp-USGS)
W73-11817

ESTIMATING WATER LOSS AND DIRECT RUNOFF FROM STORM RAINFALL BY THE USE OF THE INFILTROMETER,
Geological Survey, Menlo Park, Calif.
J. T. Limerinos.
Geological Survey open-file report, February 20, 1973. 22 p, 7 fig, 4 tab, 15 ref.

Descriptors: *Storms, *Rainfall, *Storm runoff, *Water loss, Estimating, Methodology, Infiltrometers, Hydrologic data, Correlation analysis, Evaluation, River basins, California, Infiltration, Soil properties.

Infiltrometer data were used to estimate water losses in ungaged drainage basins during storms and to determine the direct runoff from design-storm rainfall. The infiltrometer was used in 14 selected drainage basins in California where short-term records of precipitation and streamflow were available. The data were used to obtain an infiltration-index value, which then was related to the minimum infiltration rate obtained from records of rainfall and runoff. The minimum infiltration rate was used with a regional relation between the storm-recurrence interval and the ratio of storm-infiltration rate to minimum-infiltration rate to provide a means for estimating the infiltration rate used with design storms of any specified recurrence interval. (Woodard-USGS)
W73-11823

FORMATION AND COMPUTATION OF COMPONENTS IN A RIVER REGIME (FORMIROVANIYE I RASCHETY ELEMENTOV REZHIMA REK).
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02A.
W73-11825

MAXIMUM FLOOD DISCHARGES AND DEPTHS OF RUNOFF ON CARPATHIAN RIVERS (MAKSIMAL'NYYE RASKHODY I SLOI PAVODOCHNOGO STOKA REK KARPAT),
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
P. M. Lyutik.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 3-18, Moscow, 1972. 3 fig, 4 tab, 20 ref.

Descriptors: *Floods, *Flood discharge, *Flood frequency, *Runoff, *Rivers, Storm runoff, Discharge (Water), Variability, Probability, Frequency curves, Equations.
Identifiers: *Carpathians.

Probabilities of various maximum flood discharges and of corresponding depths of runoff for Carpathian rivers were based on analysis and statisti-

cal processing of data from hydrometric observations. Data of maximum discharges in 1969-70 were used to refine long-term curves of maximum discharge, depth of runoff, and flood frequency for Carpathian rivers. Probabilities of various discharges were obtained by constructing frequency curves from the greatest annual discharges. Maximum rainfall runoff of 1% probability is 3-4 cu m/sec/sq km in upper reaches of the Lomnitsa, Bystritsa Solotvinskaya, Bystritsa Nadvornyanskaya, and Prut Rivers. Lowest maximum runoff values (<1 cu m/sec/sq km) were observed in the Strvyazh and Stryy River basins. The coefficients of variation of maximum discharges for Carpathian rivers range from 0.32 (Borzhava River at Dolgoye) to 1.52 (Dereluy River at Molodiya). The coefficients of asymmetry vary between 0.30 and 3.00 or more. Greatest depths of rainfall runoff of 1% probability (350 mm or more) occur in upper reaches of the Belaya Tisza, Bystritsa Solotvinskaya, and Svicha Rivers. Minimum depths (50-100 mm) occur on rivers in the Zakarpatskaya lowland. Coefficients are derived for converting maximum rainfall runoff of 1% probability to maximum rainfall runoff of other probabilities. (See also W73-11825) (Josefson-USGS)
W73-11826

A PRECIPITATION-BASED FORECAST OF GREAT STORM FLOODS ON MOUNTAIN TRIBUTARIES OF THE DNIESTER (PROGNOZ VYSOKIKH DOZHDEVYKH PAVODKOV GORNYKH PRITOKOV DNESTRA PO OSADKAM),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 06B.
W73-11829

NATURAL REGULATION OF RUNOFF ON RIVERS IN THE NORTHWESTERN UKRAINE (YESTESTVENNAYA ZAREGULIROVANNOST'STOKA REK SEVERO-ZAPADA UKRAINY),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
I. I. Voloshin.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 121-130, Moscow, 1972. 1 fig, 2 tab, 8 ref.

Descriptors: *Runoff, *Rivers, Streamflow, Base flow, Groundwater, Topography, Karst, Seasonal, Equations.
Identifiers: *Ukraine, *Natural regulation.

Seasonal regulation of river runoff in the northwestern Ukraine is described as the distribution of monthly runoff in percent of annual runoff, and as the coefficient of natural regulation describing the base flow contribution to total annual streamflow. Rivers in the Zhitomir and Volynskoye Poles'ye have approximately the same seasonal runoff distribution, with most runoff (60%-70%) occurring in the spring and smaller amounts during other seasons of the year. The average long-term value of the coefficient of seasonal regulation for rivers in the northwestern Ukraine varies between 0.30 and 0.80. Highest values occur in the southwest on northern slopes of the Volyno-Podol'skaya upland and lowest values in the east within the Ukrainian crystalline shield. For regions in the Volynskoye and Zhitomir Poles'ye, the coefficients of natural regulation are 0.40-0.50 and for the Volyno-Podol'skaya upland they are greater than 0.60. The importance of karst in the formation of runoff is well illustrated on the Volyno-Podol'skaya upland, where large inflows of groundwater result in high values of the coefficient of natural regulation and in a uniform monthly runoff distribution. The role of karst is less significant on the Volynskoye Poles'ye, where groundwater on the left bank of the Pripyat' discharges into the Dnieper-Bug Canal and into the Western Bug basin in the direction of the Mukhavets River. (See also W73-11825) (Josefson-USGS)
W73-11833

HYDROLOGIC DATA: 1971, VOLUME V: SOUTHERN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.

Available from Calif Dept of Water Resources, P.O. Box 388, Sacramento, Calif 95802, Price $7.00. Bulletin No 130-71 December 1972. 503 p, 28 fig, 16 tab, 6 append.

Descriptors: *Hydrologic data, *Groundwater, *Surface waters, *California, Water resources, Climatic data, Streamflow, Discharge measurement, Gaging stations, Water wells, Well data, Water levels, Water quality, Chemical analysis, Waste water (Pollution), Data collections, Water resources development, Planning.
Identifiers: *Hydrologic data (Southern Calif).

The California Department of Water Resources maintains an extensive hydrologic data file in the district offices of each of its reporting areas. The data collection programs have been designed to supplement the information obtained by other agencies and cooperators to meet specific needs of the State. The data presented represent the continuing efforts of the department to compile and publish comprehensive, accurate, timely, and useful information on water quality and quantity of the State. Included are climatic data, surface water measurements, groundwater measurements, surface water quality, groundwater quality, and waste water data. (Woodard-USGS)
W73-11846

MEASUREMENTS OF CURRENTS,
Louisiana State Univ., Baton Rouge.
J. P. Schweitzer.
Available from NTIS, Springfield, Va 22151 as COM-73-10176, Price $3.00 printed copy, $1.45 microfiche. Louisiana State University Marine Science Teaching Aid, Issue 1, October 1972. 4 p, 7 fig, 6 ref.

Descriptors: *Stream gages, *Current meters, *Discharge measurement, *Water measurement, *Education, Schools (Education), Training, Environment.

Measuring the current velocity and volume of flow in a tidal canal, drainage ditch, or a small stream can be a useful and exciting field experiment for students of widely varying abilities. The experience can help develop such ecological concepts as the effects of precipitation on the watershed of a small stream, the relations of streamflow to the dimensions of the drainage basin, and seasonal changes in the flow of water through an aquatic ecosystem. The easiest way to measure the surface velocity is to place a cork or float in the current and to time the downstream passage of the float. A more interesting way of measuring surface velocity is the Thrupp method. If two nails are placed side by side in a flowing stream, then the diverging ripples will intersect at some point downstream. The velocity of the current can be inferred from the relationship between the distance separating the two nails and the distance downstream where the diverging ripples intersect. Pitot tubes are also used to measure the velocity of fluid flow. Information about the volume of water moving through an aquatic ecosystem is easy to compute by several methods and may be more useful than measurements of speed alone. Weirs and geometric methods are recommended for school use in stream-gaging projects. (Knapp-USGS)
W73-11850

FORECASTING RUNOFF FROM UNIVERSAL SURFACE GAGE SNOWMELT MEASUREMENTS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 02C.
W73-11853

STUDIES OF CATION BUDGETS IN THE SOUTHERN APPALACHIANS ON FOUR EXPERIMENTAL WATERSHEDS WITH CONTRASTING VEGETATION,
National Science Foundation, Washington, D.C.
P. L. Johnson, and W. T. Swank.
Ecology, Vol 54, No 1, p 70-79, Winter 1973. 4 fig, 7 tab, 24 ref.

Descriptors: *Cations, *Forest watersheds, *Discharge (Water), *Appalachian Mountain Region, *Physical properties, *Demonstration watersheds, *Hydrology, Calcium, Magnesium, Potassium, Sodium, Mountain forests, Vegetation, Topography, Monitoring, Hardwood, Alkali metals, Alkaline earth metals, Regression analysis, Watersheds (Basins), Ecosystems, Precipitation (Atmospheric), Elevation, Fescues, Maple trees, White pine trees, Methodology, Streamflow, Chemical analysis, Oak trees, Hickory trees.
Identifiers: *Nutrient interchange, Quercus spp, Carya spp, Acer rubrum, Castanea dentata, Festuca elatior var. arundinacea, Liriodendron tulipifera, Cornus florida, Pinus strobus, Chestnut trees.

Nutrient fluxes within and through watershed ecosystems at the Coweeta Hydrologic Laboratory, Franklin, N.C. were studied. The annual budgets and seasonal fluctuations for selected cations are described. Concentrations and flux of cations moving through a hardwood forest stand, a weed to forest succession, a hardwood coppice stand and an eastern white pine stand on steep mountain topography are compared. Stream discharge was greater by 6 percent for the successional weed stand, and 10 percent for the second hardwood coppice, but 15 percent less for the young pine stand in contrast to pretreatment levels. Although concentrations for Ca, Mg, K, and Na combined were usually less than 3.5 ppm, over 98 percent of the loss of each cation was in dissolved form on all four watersheds. Regression analysis showed that 50 to 60 percent of the variations in monthly weighted average concentration was accounted for by monthly discharge amounts. Annual losses of the four cations from the mature hardwood stand were in the amounts of approximately 7, 3, 5 and 10 kg/ha respectively for the Ca, Mg, K, and Na. Annual budgets showed net changes to be -0.8, -1.8, -2.0, and -4.3 kg/ha, respectively, for this mature hardwood ecosystem. In contrast, the weed stand lost significantly greater amounts, and the young pine and hardwood coppice watersheds showed a net gain in Ca and significantly lower losses than the mature ecosystem for the other three ions. These budgets show that major alterations to these forest ecosystems are not now producing a substantial out-flux for these cations. (Holoman-Battelle)
W73-11860

MODELING IN THE EASTERN DECIDUOUS FOREST BIOME,
Oak Ridge National Lab., Tenn.
R. V. O'Neill.
Available from NTIS, Springfield, Va., as CONF-730313-1; $4.00 in paper copy, $1.45 in microfiche. Report CONF-730313-1, 1972. 40 p, 4 fig, 4 tab, 15 ref.

Descriptors: *Biomes, *Forecasting, *Mathematical studies, *Aquatic environment, Deciduous forests, Lake stages, Eutrophication, Nutrients, Ecology, Ecosystems, Reservoir stages, Ecotypes, Forest watersheds.

Integrated models are being developed and some subsystems are being utilized that include regeneration, mortality, and other processes affecting tree populations and water movement through the forest and into associated aquatic systems. A biomass model for the open-water portions of a lake was developed by researchers at Lake George and Lake Wingra sites. Development of submodels for aquatic nutrient concentration will be initiated. Simulation of the eutrophication of shallow lakes is under consideration. (Bopp-ORNL)
W73-11907

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME IV: AREA WIDE STORM DRAINAGE AND FLOOD PLAIN MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 04C.
W73-12019

FLASH FLOOD FORECASTING AND WARNING PROGRAM IN THE WESTERN REGION,
National Weather Service, Salt Lake City, Utah. Western Region.
P. Williams, Jr., C. L. Glenn, and R. L. Raetz.
Available from NTIS, Springfield, Va., 22151, as COM-73-10251 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum NWS, WR82, December 1972. 12 p, 23 ref.

Descriptors: *Flash floods, *Floods, *Warning systems, Flood forecasting, Flood protection, Stream gages, Radar.

Flash-flood warning procedures require interpretation of available climatological data for heavy rainfall. Warning of flash floods is largely an observational problem. Potential for occurrence of heavy rains can be forecast by synoptic means and used as a basis for a flash flood watch, but specific areas where excessive rains will fall cannot be realistically predicted in most cases and must be determined using radar and reports by witnesses. In areas with considerable potential for flash floods, networks of observers can be very helpful. Because of the erratic nature of flash flooding, such a network must ideally be very extensive in order to cover a reasonable fraction of the important watersheds. The most frequently used type of network involves the cooperation of state highway patrol, state highway maintenance crews, sheriffs' offices, fire departments, and other public employees. Use of alarm gages can be very effective, and there are many places in the western region which could use these gages to advantage. (Knapp-USGS)
W73-12020

RESISTANCE LOSSES IN NONCIRCULAR FLOOD CONTROL CONDUITS AND SLUICES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12027

FLOW AND CHEMICAL CHARACTERISTICS OF THE ST. JOHNS RIVER AT JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02L.
W73-12030

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1971,
Geological Survey, Dallas, Tex. Water Resources Div.
H. D. Buckner.
Geological Survey open-file report, May 1973. 10 p, 1 fig.

Descriptors: *Hydrologic data, *Streamflow, *Reservoirs, *Texas, River basins, Rainfall, Runoff, Flow rates, Stream gages, Lakes, Inflow, Basic data collections.
Identifiers: *Mountain Creek (Tex), *Tarrant County (Tex), Reservoir content.

Records of streamflow and reservoir content for the 1971 water year are presented for the Mountain Creek, Texas, hydrologic system. Mountain Creek drains the northeast corner of Johnson County, the northwest corner of Ellis County, the southeast corner of Tarrant County, and part of the southwest corner of Dallas County. The basin is 30 miles long and averages 10 miles in width. The total drainage area at the mouth is 304 square miles. Basin outflow for the 1971 water year was 13,670 acre-feet. Storage in Mountain Creek Lake showed a net loss of 1,070 acre-feet during the water year. Rainfall over the study area for the 1971 water year was about 24 inches, which is about 10 inches less than the long-term mean for the area. (Woodard-USGS)
W73-12038

INVESTIGATION OF EFFECT OF SOIL FREEZING DEPTH AND OTHER FACTORS ON SNOWMELT RUNOFF ON RIVERS IN STEPPE AND FOREST-STEPPE ZONES (ISSLEDOVANIYE VLIYANIYA GLUBINY PROMERZANIYA POCHVY I DRUGIKH FAKTOROV NA TALYY STOK REK STEPNOY I L ESOSTEPNOY ZON),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
V. D. Komarov, and T. T. Makarova.
Meteorologiya i Gidrologiya, No 8, p 67-74, August 1972. 2 fig, 7 ref.

Descriptors: *Snowmelt, *Runoff, *Rivers, *Soils, *Freezing, Depth, Soil moisture, Water storage, Water equivalent, Floods, River basins, Grasslands, Forests, Equations.

Investigations of the effect of soil freezing on absorption of melting snow by river basins in the southern half of European Russia were based on 1948-70 observation data of the Pridesnyanskaya station for the Golovesnya River basin (drainage area--29.5 sq km), and of the Nizhnedevitskaya station for the Devitsa River basin (drainage area--76.0 sq km). Relations are obtained relating maximum possible snowmelt losses to both soil freezing depth and soil moisture and to anomalous melt periods. The accuracy of computing snowmelt losses from the established relations is high. (Josefson-USGS)
W73-12055

PATTERNS OF STREAM-DISCHARGE VARIABILITY (ZAKONOMERNOSTI V IZMENENII MODULYA STOKA),
Bulgarian Academy of Sciences, Sofia. Inst. of Hydrology and Meteorology.
G. I. Gergov.
Meteorologiya i Gidrologiya, No 8, p 75-81, August 1972. 4 fig, 12 ref.

Descriptors: *Discharge (Water), *Runoff, *Variability, Discharge measurement, Watersheds (Basins), Areal, Elevation, Curves, Equations.
Identifiers: *Bulgaria, Isolines.

A study was made of some stream-discharge characteristics and methods of discharge determination in Bulgaria. The effect of basin morphometry on maximum discharges is discussed, and graphs are constructed of empirical relations relating maximum discharge to both basin area and elevation. (Josefson-USGS)
W73-12056

APPLICATION OF THE SOURCE-AREA CONCEPT OF STORM RUNOFF TO A SMALL ARIZONA WATERSHED,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02A.
W73-12067

ATTENUATION OF SWELL BY SEA ICE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 02C.
W73-12082

SOME KINETIC ENERGY SPECTRA IN A NEARSHORE REGION OF LAKE ONTARIO,
Ontario Ministry of the Environment, Toronto.
M. D. Palmer.
Journal of Geophysical Research, Vol 78, No 18, p 3585-3595, June 20, 1973. 9 fig, 4 tab, 18 ref.

Descriptors: *Waves (Water), *Currents (Water), *Seiches, *Lake Ontario, *Turbulence, Current meters, Water circulation, Thermocline.
Identifiers: Kinetic energy spectra.

The nearshore kinetic energy spectrum measured at 5.3 meters below the surface in 9 m of water on Lake Ontario is different in shape from that measured farther offshore in the epilimnion at 5.8 m below the surface in 22 m of water. The nearshore spectrum approximates a slope of -3.0, which is similar to that for a boundary layer. The spectrum reflects the lake seiche periodicities. Farther offshore the spectrum approximates a slop of -1.6. Energy in the nearshore region is present at lower wave numbers than energy in a similar offshore region, and the integral scale in the nearshore region (2.4 m) is approximately half that in the offshore region (4.3 m). (Knapp-USGS)
W73-12084

FLOOD PLAIN INFORMATION, LEHIGH RIVER, JORDAN CREEK AND TROUT CREEK, CITY OF ALLENTOWN, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W73-12238

FLOOD PLAIN INFORMATION, LITTLE LEHIGH CREEK, CEDAR CREEK, LITTLE CEDAR CREEK, ALLENTOWN, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W73-12239

A COMPREHENSIVE ANALYSIS OF A MAJOR STORM AND ASSOCIATED FLOODING IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02B.
W73-12242

FLOOD EVALUATION - CAN STOCHASTIC MODELS PROVIDE AN ANSWER,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-12276

HYDROLOGIC FORECASTING WITH SEQUENTIAL DETERMINISTIC AND STOCHASTIC STAGES,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W73-12280

STREAMFLOW FREQUENCY USING STOCHASTICALLY GENERATED HOURLY RAINFALL,
CH2M/Hill, Bellveue, Wash.
R. F. Ott, and R. K. Linsley.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water

Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p230-244, 1972. 8 fig, 3 tab, 16 ref.

Descriptors: *Streamflow, *Frequency analysis, *Stochastic processes, *Monte Carlo methods, *Flood peak, *Hydrology, Watersheds (Basins), Mathematical models, Systems analysis, *Risks.

To investigate the uncertainity of the return period of extreme floods, a rainfall synthesis model by Franz (1970) is employed to generate 500 years of multistation hourly rainfall for two watersheds in the United States. This rainfall is then converted to streamflow by a deterministic watershed mode. Once the 500 years of hourly streamflow are available for each watershed, the Gumbel and the Log-Pearson Type III methods of frequency analysis are performed on each series. In deriving the parameters for the Gumbel Extreme Value Distribution, comparison is made between the methods of moments and maximum likelihood. For the Log-Pearson III analysis, the effects of the applications of the coefficient of skewness and adjusting for length of record are studied. Monte Carlo techniques are employed to determine the uncertainity of extrapolating these methods to estimate flood peaks from streamflow records of various lengths. (See also W73-12269) (Bell-Cornell)
W73-12284

EFFECT OF LENGTH OF RECORDS OF MONTHLY FLOWS ON THE FIRST SERIAL CORRELATION COEFFICIENT,
Asian Inst. of Tech., Bangkok (Thailand).
S. Pinkayan.
In: Proceedings (Vol. I), International Symposium on Uncertanties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 245-252, 1972. 4 fig, 9 ref.

Descriptors: *Streamflow, *Hydrologic data, *Simulation analysis, *Markov processes, Monthly, Flows, Time series analysis, Mathematical models, Systems analysis.
Identifiers: *Thailand.

In developing countries, most streamflow data has been recorded for a short period of time. Current water resource projects are investigated by means of mathematical simulations. Streamflow sequences which are the input of the simulation model are synthesized on the basis of preservating a certain fundamental statistics of the historical records, such as mean, standard deviation, and serial correlation. The accuracy of the results from simulation depends upon the reliability of the estimation of these statistical parameters which implies that they depend upon the lengh of records. Among these three statistical parameters, serial correlation, which is a measure of the correlation between the successive observations, is of great importance. The investigation of the effect of length of records on the first serial correlation is made by an analysis of monthly flows at a selected station in Thailand. The monthly flow sequences were made to be stationary by means of normalization, which is obtained by deducting the monthly long term mean from each monthly value and dividing the result by the long term standard deviation of that month. The normalized time series are assumed to follow the first order Markov process. The expectation of the first serial correlation coefficient of the normalized time series increases when the length of records was made longer. Its variance decreases when the recorded length increases. (See also W73-12269) (Bell-Cornell)
W73-12285

STOCHASTIC STREAM TEMPERATURE MODEL,
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 04A.
W73-12289

THE DIRECTIONAL ANALYSIS OF OCEAN WAVES: AN INTRODUCTORY DISCUSSION (SECOND EDITION),
Naval Coastal Systems Lab., Panama City, Fla.
C. M. Bennett.
Available from NTIS, Springfield, Va 22151 as AD-753 825 Price $3.00 printed copy; $1.45 microfiche. Informal Report NCSL 144-72, December 1972. 81 p, 8 fig, 18 ref, 3 append. (formerly NSRDL/PC3472).

Descriptors: *Ocean waves, Oceanography, *Winds, *Waves (Water), *Wavelengths, Mathematical models, Systems analysis, Computer programs, Input-output analysis, Ocean currents, Equations.
Identifiers: *Wave directional analysis.

An introductory discussion of the mathematics behind the directional analysis of ocean waves is presented. There is sufficient detail for a reader interested in applying the methods' further, the report can serve as an entry into the theory. The presentation is basically tutorial but does require a reasonably advanced mathematical background. Results of a program for the measurement of directional ocean wave bottom pressure spectra are included as an appendix. This second edition makes corrections to the first and adds some details of an iterative directional analysis method. The least square method of using the information in a spectral matrix is probably the best method presently available. Examples of such analyses can be found in several of the papers in the bibliography. A collection of ocean-wave induced, bottom pressure directional spectra from these papers is given. Some details of the least square method are given along with sample result and a FORTRAN program for the method. (Woodard-USGS)
W73-12306

NUMERICAL MODEL STUDIES OF THE ST. LAWRENCE RIVER,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
For primary bibliographic entry see Field 02L.
W73-12313

SEASONAL REGIME AND HYDROLOGICAL SIGNIFICANCE OF STREAM ICINGS IN CENTRAL ALASKA,
For primary bibliographic entry see Field 02C.
W73-12314

2F. Groundwater

STUDIES OF SAPROLITE AND ITS RELATION TO THE MIGRATION AND OCCURRENCE OF GROUNDWATER IN CRYSTALLINE ROCKS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 02G.
W73-11706

SUBSURFACE INDUSTRIAL WASTE WATER INJECTION IN ILLINOIS,
Ohio River Valley Sanitation Commission, Cincinnati. Committee on Subsurface Industrial Waste Water Injection.
For primary bibliographic entry see Field 05E.
W73-11820

TIME LAG RESPONSE IN BOULDER CLAY WELLS,
Hull Univ. (England). Dept. of Geography.
M. Bonell.
Nordic Hydrology, Vol 4, No 2, p 86-104, 1973. 4 fig, 2 tab, 24 ref.

Descriptors: *Water level fluctuations, *Time lag, *Till, *Rainfall, *Evapotranspiration, Water balance, Statistics, Statistical methods, Recharge, Discharge (Water), Hydrogeology, Aquifer characteristics, Hydrographs, Hydrograph analysis.

In a small boulder clay catchment, a time lag response to rainfall and potential evapotranspiration was measured. A statistical method to detect this time lag and therefore translate this mechanism into quantitative terms was tested. The analysis proved to be very successful despite some defects in the original data. The results confirm the general trends indicated in hydrograph and contour map analyses. The statistical analysis consisted of intercorrelation of well levels and generation of a stream of simple correlations between individual well fluctuations and antecedent 3-day running means of the hydrometeorological data. (Knapp-USGS)
W73-11842

ON THE GROUND-WATER DISCHARGE TO THE BALTIC SEA AND METHODS FOR ESTIMATING IT,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. S. Zektzer.
Nordic Hydrology, Vol 4, No 2, p 105-118, 1973. 1 fig, 2 tab, 13 ref.

Descriptors: *Discharge (Water), *Groundwater, *Water balance, Base flow, Surface-groundwater relationships, Europe.
Identifiers: *Baltic sea.

Methods for quantitatively estimating groundwater discharge to the Baltic Sea and the possibilities of applying these methods to investigations of the role of groundwater in the water and salt balances of the Baltic Sea are discussed. The combined hydrological and hydrogeological method, the hydrodynamic method, and the method of the average long-term water balance of recharge areas are recommended. Data on the groundwater discharge to the Baltic Sea from the zone of intensive circulation (relatively shallow aquifers) within the USSR, are presented. The groundwater discharge from the zone of intensive circulation within the area of the USSR estimated by the combined hydrological and hydrogeological method, amounts to 38.5 cu m/sec. The groundwater discharge from the zone of intensive circulation of the Baltic artesian basin, within which the principal part of submarine groundwater outflow is formed, amounts to about 35 cu m/sec or about 6.5% of the total of fresh groundwater discharge of this basin (Zektzer 1968). The surface-water discharge from the Baltic artesian basin amounts to 78.8 cu km/year. Thus the groundwater discharge to the Baltic Sea from upper aquifers amounts to about 1.5% of the total streamflow. The total value of salt transport to the Baltic Sea from the zone of intensive circulation amounts to about 500,000 t/year. About 200 tons of salts are discharged annually with groundwater on every linear kilometer of the coast. (Knapp-USGS)
W73-11843

HYDROLOGIC DATA: 1971, VOLUME V: SOUTHERN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02E.
W73-11846

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN DAY COUNTY, SOUTH DAKOTA,
South Dakota State Geological Survey, Vermillion.
D. I. Leap.
Information Pamphlet No 3, 1972. 4 p, 4 fig, 1 tab, 1 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Sands, *Gravels, *South Dakota, Water yield, Water quality, Sand pits, Sites, Sediments, Geology.
Identifiers: *Sand and gravel resources (S Dak).

The general distribution, quality, and physical characteristics of the major aquifers in Day County, South Dakota, the general distribution of sand and gravel resources in Day County, and the optimum areas in the County to explore for further development of sand and gravel resources are described. Day County contains three distinctly different major outwash aquifers--the Lynn, Lonesome Lake, and Eastern Lakes system. Production from a properly designed, gravel-packed well in the Lynn aquifer could be expected to be around 500 gallons per minute. The water in the Lynn aquifer is quite high in sulfate, calcium, and bicarbonate. The Lonesome Lake aquifer should produce 150 gpm with a properly designed well. (Woodard-USGS)
W73-11847

ISOTOPE METHODS IN GROUNDWATER SCIENCE (ISOTOPENMETHODEN IN DER GRUNDWASSERKUNDE),
European Atomic Energy Community, Brussels (Belgium). Bureau Eurisotop.
W. Drost, H. Moser, F. Neumaier, and W. Rauert.
Available from NTIS Springfield, Va., as EURISOTOP-61; $7.60 in paper copy, $1.45 microfiche. Report EURISOTOP 61, May 1972. 183 p, 66 fig, 6 tab, 300 ref.

Descriptors: *Groundwater movement, *Hydrogeology, *Aquifer characteristics, *Radioisotopes, Tracers, Water table, Natural recharge, Radioactivity techniques, Fallout, Methodology, Reviews, Bibliographies, Boreholes, Hydrology, Inflow, Surface-groundwater relationships, On-site investigations, Soil water, Instrumentation, Soil moisture, Oxygen isotopes, Tritium, Reviews.

The principal coverage of this review is the point-dilution method for measuring the rate and direction of groundwater flow, also called the single-borehole method (E. Gaspar and M. Oncescu, Radioactive Tracers in Hydrology, Elsevier Publishing Co., N.Y., 1972), and multiple borehole methods. Brief discussion is given to use of gamma and neutron sources in measuring soil moisture and the water table, and use of cosmogenic (018) and nuclear-weapons-testing-fallout (tritium) radionuclides to trace the origin of natural waters. (Bopp-ORNL)
W73-11929

EXTENT OF DEVELOPMENT AND HYDROLOGIC CONDITIONS OF THE ALLUVIAL AQUIFER, FOUNTAIN AND JIMMY CAMP VALLEYS, COLORADO, 1972,
Geological Survey, Denver, Colo.
D. L. Bingham, and J. M. Klein.
Colorado Water Resources Circular No 16, 1973. 28 p, 5 fig, 2 plate, 2 tab, 9 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water wells, *Colorado, Hydrologic data, Water yield, Water quality, Water types, Well data, Water levels, Water utilization, Irrigation wells, Municiapal water, Observation wells, Maps, Hydrographs, Specific conductivity.
Identifiers: *Fountain valley (Colo).

Groundwater development of the Fountain Creek alluvium of the Fountain Valley (Colorado Springs to Pueblo, Colo.) increased markedly during the early 1950's. Groundwater provides water for municipal, industrial, irrigation, and domestic uses. In 1972 about 270 wells were reported to yield more than 100 gallons per minute. Groundwater withdrawal for all uses during 1971 is estimated to be 18,000 acre-feet. Water levels in the spring of 1972 are about the same as those measured from 1954-57. The specific conductance of the groundwater ranges from about 500 to about 3,400 micromhos per centimeter and generally increases in a downstream direction. (Woodard-USGS)
W73-12023

POTENTIAL FOR GROUND WATER POLLUTION FROM THE LAND DISPOSAL OF SOLID WASTES,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-12025

HYDROLOGIC RECONNAISSANCE OF PILOT VALLEY, UTAH AND NEVADA,
Geological Survey, Salt Lake City, Utah.
J. C. Stephens, and J. W. Hood.
Utah Department of Natural Resources Technical Publication No 41, 1973. 38 p, 4 fig, 1 plate, 11 tab, 43 ref, append.

Descriptors: *Hydrologic data, *Groundwater resources, *Water wells, *Hydrogeology, *Utah, Nevada, Hydrology, Water quality, Precipitation (Atmospheric), Snowmelt, Irrigation wells, Withdrawal, Water yield, Groundwater recharge, Evapotranspiration, Aquifer characteristics, Geology, Climatic data, Basic data collections, Water level fluctuations.
Identifiers: *Pilot Valley (Utah and Nev).

Pilot Valley is an area of about 470 square miles in southwestern Box Elder and northwestern Tooele Counties, Utah, and eastern Elko County, Nevada. The valley is bounded on the east and south by the Silver Island Range, and on the west by the Pilot Range. The bottom of the valley, about two-thirds of which is a barren alkali flat, is part of the Great Salt Lake Desert. The climate is arid to semiarid. The principal source of runoff and groundwater recharge is the snowpack that accumulates on the mountains in winter. Annual groundwater recharge is estimated to be 7,500 acre-feet. About 3,400 acre-feet of recharge is derived from precipitation on the area above an altitude of 5,600 feet. The remaining 4,100 acre-feet of recharge is groundwater inflow from adjacent areas. Annual discharge of groundwater approximately equals annual recharge. The groundwater reservoir above an altitude of about 4,250 feet contains water of satisfactory quality for most uses. Below 4,250 feet, water in the alluvial deposits is generally too saline for most uses. (Woodard-USGS)
W73-12029

GROUND-WATER RESOURCES OF RAINS AND VAN ZANDT COUNTIES, TEXAS,
Geological Survey, Austin, Tex.
D. E. White.
Texas Water Development Board Report 169, April 1973. 81 p, 26 fig, 6 tab, 35 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Texas, Water wells, Well data, Water utilization, Withdrawal, Water yield, Groundwater recharge, Geology, Irrigation wells, Industrial water, Municipal water, Domestic water, Hydrologic data, Water levels.
Identifiers: *Rains County (Tex), *Van Zandt County (Tex).

Rains and Van Zandt Counties in northeast Texas have abundant water resources and comparatively little water demand. The water is derived from the heavy precipitation (about 43 inches annually) which fills the numerous lakes and reservoirs and recharges the freshwater aquifers. One of the aquifers in the area, the Carrizo-Wilcox, has been appreciably developed. During 1969, this aquifer supplied a reported 1,500 acre-feet of water for municipal supply, industrial use, and rural water systems in the two counties. The Carrizo-Wilcox aquifer contains an estimated 50 million acre-feet of fresh to slightly saline water in storage. About 10% of this amount, or 5 million acre-feet, is available to wells. In addition to the water in storage, the Carrizo-Wilcox aquifer annually receives an estimated 5,000 acre-feet of effective recharge from precipitation. Yields of wells tapping the Carrizo-Wilcox aquifer range from less than 5 to as much as 600 gpm. Most of the municipal and industrial wells are equipped to pump at rates of 100 to 250 gpm. A second aquifer, the Queen City Sand, in southeastern Van Zandt County, which is currently tapped solely for rural domestic and livestock supply, is probably capable of yielding as much as 150 gpm of freshwater to properly constructed wells. (Woodard-USGS)
W73-12031

GROUND-WATER RESOURCES OF WHEELER AND EASTERN GRAY COUNTIES, TEXAS,
Geological Survey, Austin, Tex.
M. L. Maderak.
Texas Water Development Board Report 170, May 1973. 67 p, 11 fig, 7 tab, 11 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water wells, *Texas, Water quality, Well data, Water utilization, Water supply, Irrigation wells, Industrial water, Municipal water, Domestic water, Withdrawal, Pumping, Water yield, Groundwater recharge, Geology, Hydrologic data, Water levels.
Identifiers: *Wheeler County (Tex), *Gray County (Tex).

Wheeler and eastern Gray Counties are in the east-central part of the Texas Panhandle. The Ogallala Formation, the principal source of fresh groundwater in the area, supplies nearly all the water for municipal supply and slightly more than half of the water used for irrigation. The Blaine Formation and the Whitehorse Group are sources of water principally for irrigation. Groundwater pumpage in 1966 was about 10,200 acre-feet, an increase of nearly three times the amount pumped in 1955. Of the pumpage in 1966, 6,900 acre-feet was for irrigation. The withdrawals of groundwater since at least 1955 apparently have not caused a serious decline in the water table or in the amount of water in storage. The Ogallala Formation yields water that generally contains less than 500 mg/liter dissolved solids and is the calcium bicarbonate type. The water from the Blaine Formation and Whitehorse Group, which is unsuitable for domestic or municipal supplies, is more highly mineralized and is of the calcium sulfate type. The water is used for irrigation seemingly without detrimental effect. On the basis of the capacity of the Ogallala Formation to transmit water under the present hydraulic gradient, about 15,000 acre-feet per year is moving through the aquifer. (Woodard-USGS)
W73-12032

GROUND-WATER RESOURCES OF THE MORA RIVER DRAINAGE BASIN, WESTERN MORA COUNTY, NEW MEXICO,
Geological Survey, Santa Fe, N. Mex.
J. W. Mercer, and E. G. Lappala.
Available from NITS, Springfield, Va 22151 as COM-73 10352 Price $3.00 printed copy; $1.45 microfiche. New Mexico State Engineer Technical Report 37, 1972. 91 p, 16 fig, 2 plate, 5 tab, 29 ref, 8 append.

Descriptors: *Groundwater resources, *Irrigation water, *New Mexico, *Water wells, *Aquifer characteristics, Hydrogeology, Well data, Water level fluctuations, Water quality, Chemical analysis, Climatic data, Economic aspects, Water resources development, Groundwater movement, Water yield, Groundwater recharge, Streams, Precipitation (Atmospheric), Hydrologic data.

Identifiers: *Mora County (N Mex), *Mora River Drainage Basin (N Mex).

Shortages of surface water for irrigation during the latter part of the growing season have limited agricultural development in western Mora County in northwestern New Mexico. The possibilities are described for developing groundwater for supplementary use. In nearly all of the Mora River drainage, unconsolidated Quaternary deposits of alluvial, colluvial, lacustrine, and glacial origin fill the stream valleys and contain groundwater. Thicknesses of these deposits range from a few feet in tributary valleys to more than 300 feet in the Mora Valley in western Mora County. Groundwater development appears to be feasible in the alluvial valley near Watrous. Unconsolidated deposits in this area are relatively homogeneous and isotropic. Transmissivity values range from 3,400 to 20,000 sq ft/day, and the assumed maximum storage coefficient value is 0.2. The amount of groundwater in storage is about 4,000 acre-feet. Annual withdrawals taken from aquifer storage by pumpage would be substantially replaced by recharge from the river and by return flow from irrigation water. The chemical quality of both surface and groundwater throughout the alluvial valleys of western Mora County meets the established criteria for irrigation use. (Woodard-USGS)
W73-12035

THE EFFECTS OF PLUGGING A DEEP ARTESIAN WELL ON THE CONCENTRATION OF CHLORIDE IN WATER IN THE WATER-TABLE AQUIFER AT HIGHLAND ESTATES, LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
D. H. Boggess.
Geological Survey Open-file Report 73003, 1973. 20 p, 5 fig.

Descriptors: *Saline water intrusion, *Artesian wells, *Water pollution treatment, *Florida, Water pollution sources, Chlorides, Saline water, Water wells, Recharge, Leaching.
Identifiers: *Lee County (Fla).

Upward leakage of saline water from deep artesian wells has caused widespread deterioration in quality of water in the shallow artesian aquifers underlying Lee County, Florida. The water-table aquifer has been affected similarly when saline water from the deep artesian wells has been allowed to discharge at the surface, or when corroded well casings have developed leaks at shallow depth. In January 1968 chloride concentrations ranging from 200 to 590 mg/liter were determined in four shallow wells drilled to the water-table aquifer at Highland Estates. After the artesian well was plugged in February 1968 the chloride in the water from the affected shallow wells decreased rapidly and by August 1968 ranged from 80 to 245 mg/liter. By October 1969 the chloride concentrations had decreased to 60-80 mg/liter. More than 4 years after plugging, some residual effect of the saline water still remained. However, the chloride concentration in the two wells nearest the source of saline water was within the normal range of concentrations determined for the water-table aquifer in the area. The natural processes of flushing and dilution should dissipate all the effects of the saline water. (Knapp-USGS)
W73-12039

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS: VOLUME I,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 05E.
W73-12051

HYDROLOGIC SIGNIFICANCE OF LITHOFACIES OF THE CANE RIVER FORMATION OR EQUIVALENTS OF ARKANSAS, LOUISIANA, MISSISSIPPI, AND TEXAS,
Geological Survey, Washington, D.C.
J. N. Payne.
Available from GPO, Washington, DC 20402 - Price $10.90. Geological Survey Professional Paper 569-C, 1972. 17 p, 4 fig, 16 plate (bound separately), 1 tab, 61 ref.

Descriptors: *Hydrogeology, *Gulf Coastal Plain, *Sandstones, Arkansas, Louisiana, Mississippi, Texas, Recharge, Water yield, Groundwater resources, Groundwater movement, Water quality, Water chemistry.
Identifiers: *Cane River Formation.

The study of the Cane River Formation and its equivalents is part of an investigation of the geohydrology of the Claiborne Group of the Gulf Coastal Plain. The thickness of the Cane River Formation ranges from 70 feet in La Salle Parish, La., to 750 feet in the Desha basin of Arkansas. The coefficient of permeability probably increases with increase in thickness. Recharge of the Cane River is mainly by precipitation in the outcrop area, but a minor amount of recharge takes place by the upward movement of water from the underlying Meridian-upper Wilcox aquifer. Regional flow of water is generally down the dip. In and near the outcrop area, water from the Cane River Formation contains proportionately high concentrations of calcium and magnesium. Farther downdip, sodium is the dominant cation. In Mississippi the dominant anion is bicarbonate. In Arkansas and Louisiana the chloride anion occurs in significant proportions. Recharge of the Reklaw and Queen City Formations takes place by infiltration of precipitation in the outcrop area, by infiltration of water from streams, and by upward movement of water from the Carrizo Sand. The distribution of solutes reflects the extent of flushing by freshwater. (Knapp-USGS)
W73-12053

GROUNDWATER RECHARGE THROUGH THE ZONE OF AERATION IN A SANDY DESERT (PITANIYE GRUNTOVYKH VOD PESCHANOY PUSTYNI CHERZ ZONU AERATSII),
V. N. Chubarov.
Izdatel'stvo 'Nedra', Moscow, 1972. 136p.

Descriptors: *Groundwater recharge, *Zone of aeration, *Deserts, *Sands, Soils, Vegetation, Soil moisture, Soil temperature, Infiltration, Evapotranspiration, Equilibrium, Water balance, Rainfall, Freshwater, Water table, Water level fluctuations, Water vapor, Analytical techniques, Instrumentation, Maps.
Identifiers: *Karakum Desert, Barchans, Moisture potentials, Capillary-potential relationships, Mineralization.

Characteristics of water transfer in the zone of aeration of a sandy desert were investigated in the Yaskhan region of the Karakum Desert in Turkmenistan. The presence of fresh groundwaters in the desert is mainly associated with exchange of water with the atmosphere through the zone of aeration. Methods are presented for estimating amounts of recharge from rainfall and for determining parameters of water transfer by centrifugation of soil samples and analysis of the moisture field. Data on conditions that influence recharge through the zone of aeration (infiltration, evaporation, transpiration, and equilibrium) are tabulated, diagrammed, and mapped. (Josefson-USGS)
W73-12061

GEOLOGY FOR PLANNING IN ST. CLAIR COUNTY, ILLINOIS.
Illinois State Geological Survey, Urbana.

Illinois State Geological Survey Circular 465, 1971. A. M. Jacobs compiler. 35 p, 4 fig, 8 tab, 63 ref.

Descriptors: *Geological surveys, *Mining, *Groundwater resources, *Mississippi River, *Illinois, Land management, Water quality control, Waste disposal, Mine wastes, Strip mine wastes, Spoil banks, Water pollution sources, Water quality, Hydrogeology, Water yield, Data collections, Maps, Planning.
Identifiers: *St. Clair County (Ill).

St. Clair County lies in southwestern Illinois across the Mississippi River from St. Louis, Missouri. One-fifth of the total land surface of 673 square miles is on flood plains of the Mississippi and Kaskaskia Rivers and Silver Creek. The flood plains are underlain by as much as 120 feet of gravel, sand, silt, and clay. The remaining four-fifths of the land surface is on uplands that contain flat or dissected plains, low ridges and mound-shaped hills, about 20 square miles of strip mines, and an area of karst topography. Mineral and water resources are abundant in the county. Water resources include groundwater from near-surface unconsolidated deposits and from bedrock and surface water from the Mississippi River. In some areas geologic conditions impose limitations on the use of land for construction and the disposal of waste, whereas in other areas no particular problems preclude use for those purposes. Rarely are the limitations severe enough that they cannot be overcome by available engineering and construction techniques. This geologic information was prepared for land-use and resource planning on a county-wide scale. (Woodard-USGS)
W73-12069

PHYSICAL ASSUMPTIONS AND THEIR CONSEQUENCES ON MODELLING GROUNDWATER MOVEMENT,
For primary bibliographic entry see Field 04B.
W73-12288

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE JULESBURG REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
R. T. Hurr, and P. A. Schneider, Jr.
Geological Survey open-file report, 1972. 2 p, 6 sheet, 1 fig, 6 plate, 4 ref.

Descriptors: *Hydrologic data, *Hydrogeology, *Aquifer characteristics, *Valleys, *Colorado, Geomorphology, Alluvial aquifers, Water wells, Bedrock, Water table Transmissivity, Maps.
Identifiers: *South Platte River Valley (Colo), Julesburg Reach, Stream depletion, Hydrologic atlas.

This hydrologic atlas of the Julesburg Reach of the South Platte River Valley, Colorado, contains 6 maps, scale one mile to the inch showing: (1) location of wells in the Julesburg reach of the South Platte River Valley, Colorado, 1968; (2) map showing bedrock configuration beneath the valley-fill aquifer in the Julesburg reach of the South Platte River Valley, Colorado; (3) map showing water table contours of the valley-fill aquifer in the Julesburg reach of the South Platte River Valley, Colorado, March 1968; (4) map showing saturated thickness of the valley-fill aquifer in the Julesburg reach of the South Platte River Valley, Colorado, March 1968; (5) map showing transmissivity of the valley-fill aquifer in the Julesburg reach of the South Platte River Valley, Colorado; and (6) map showing stream-depletion-factor of the valley-fill aquifer in the Julesburg reach of the South Platte River Valley, Colorado. (Woodard-USGS)
W73-12296

THE EVALUATION AND APPLICATION OF C--14 DATING OF GROUNDWATER,
Geological Survey, Washington, D.C.
F. J. Pearson, Jr.

Available from NTIS, Springfield, Va 22151 as AD-748 877 Price $3.00 printed copy; $1.45 microfiche. Final Project Report to Army Research Office (No 5830.6-EN), 1972. 70 p, 22 fig, 5 tab, 39 ref.

Descriptors: *Radioactive dating, *Carbon radioisotopes, *Groundwater, *Groundwater movement, *Hydrology, Carbonates, Analytical techniques, Soil types, Hydrogeology, Geochemistry.
Identifiers: *Carbon-14.

The carbon-14 method is a useful addition to the techniques for the study of groundwater hydrology. To use it successfully requires an understanding of the carbonate chemistry of the systems being investigated. To adjust C-14 measurements the proportion of soil air to aquifer-derived carbonate species must be known. In systems in which marine limestone is the only carbonate derived from the aquifer, C-13 values of the dissolved carbonate can be used to determine this proportion directly. In temperature climates the C-13 value for soil air and recharge carbonate is approximately -2.5%. In arid and subtropical regions soil CO2 may have C-13 values in the range of -1.2% to -1.8%. Carbon-14 measurements are useful in studying groundwater flow rates and the rates of physical and chemical processes occurring in groundwater systems. In addition, they are useful to differentiate between sources of water in mixed water situations and for determining areas of recharge and discharge in otherwise unknown hydrologic systems. (Woodard-USGS)
W73-12297

FEASIBILITY STUDY OF THE EXPLOITATION OF ELECTROMAGNETIC SURFACE WAVE PROPAGATION FOR MINERAL PROSPECTING AND MAPPING THE WATER TABLE,
Nebraska Univ., Lincoln. Dept. of Electrical Engineering.
E. Baha.
Available from NTIS, Springfield, Va COM-73 10309 Price $3.00 printed copy; $1.45 microfiche. Research Series 0072-01 (final report), (1972). 23 p, 13 fig, 10 ref. NOAA E22-26-71 (G).

Descriptors: *Groundwater resources, *Mineralogy, *Mapping, *Water table, Methodology, Radio waves, Radiation, Electromagnetic waves, Geomorphology, Mathematical studies, Equations, Evaluation, Computer programs.

The feasibility of employing a radio wave method for the purpose of mapping the underground water resources and mineral prospecting was explored. A full wave solution to the problem of propagation of radio waves over nonuniform layered media was derived. In the analysis, the thickness and the electrical parameters of the overburden are assumed to be functions of distance along the path of propagation. Excitation by concentrated sources was considered; thus both plane wave and surface wave excitation are accounted for. The substratum which is assumed to be a good conducting medium is characterized by a finite surface impedance. A computer program has been written to determine the scattered field pattern for typical overburden parameters. The computation of the scattered radiation pattern due to plane wave excitation is very satisfactory, however the computations involving surface wave scattering require some additional refinements. (Woodard-USGS)
W73-12311

2G. Water in Soils

STUDIES OF SAPROLITE AND ITS RELATION TO THE MIGRATION AND OCCURRENCE OF GROUNDWATER IN CRYSTALLINE ROCKS,
Georgia Univ., Athens. Dept. of Geology.
J. H. Howard, III.
Available from the National Technical Information Service as PB-222 002, $3.00 in paper copy, $ 1.45 in microfiche. Environmental Resources Center, Georgia Institute of Technology Atlanta Report ERC-0473, June 1973, 23 p, 7 fig, 18 ref. OWRR-B-010-GA (1). 14-01-0001-1488.

Descriptors: *Hardpan, *Groundwater recharge, Saprolites, Subsoil, Rock properties, Permeability.
Identifiers: *Low-permeability zone, *Rock weathering, Georgia Piedmont.

Geochemical, mineralogical, and textural studies of weathering mantles of crystalline rocks of the Georgia Piedmont show that a low-permeability horizon, which develops during the weathering of some rock types and which impedes infiltration of water from the surface, is formed by the accumulation of kaolinite and oxides of iron, aluminum, and silicon. Three types of hardpan were found, but only one is extensive in its impedance of water infiltration. This is a dense layer, often several feet thick and composed of acculations of hematite, kaolinite, and probably silica, which forms in the weathering mantle of granitic and gneissic rocks. It may be possible to disrupt this low-permeability layer by application of organic reducing agents, thus increasing water infiltration for recharge of the underlying water table. The geologic terrane is of greatest importance in the development of the low-permeability horizons, which develop on rocks of fairly uniform structure and texture: plutonic granites and granite gneisses. Low-permeability zones do not develop on dense fine-grained rocks or metamorphic rocks with inclined foliation. Favorable well sites can be selected on the basis of a knowledge of the areal geology, so that areas with likelihood of hardpan development, and thus low water infiltration, can be avoided. (James-Georgia)
W73-11706

SOIL MOISTURE EXTRACTION AND IRRIGATION DESIGN REQUIREMENTS FOR CORN,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 03F.
W73-11727

DAIRY WASTE PONDS EFFECTIVELY SELF-SEALING,
Agricultural Research Service, Riverside Calif. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W73-11764

ESTIMATING WATER LOSS AND DIRECT RUNOFF FROM STORM RAINFALL BY THE USE OF THE INFILTROMETER,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02E.
W73-11823

STEADY UPWARD AND DOWNWARD FLOWS IN A CLASS OF UNSATURATED SOILS,
Wisconsin Univ., Madison.
P. A. C. Raats.
Soil Science, Vol 115, No 6, p 409-413, June 1973. 2 fig, 13 ref.

Descriptors: *Soil water movement, *Unsaturated flow, *Steady flow, Evapotranspiration, Infiltration, Capillary action, Irrigation water, Recharge, Drainage, Hydraulic conductivity.

Steady upward and downward flows of soil water may be analyzed on the basis of a three-parameter empirical relationship between the pressure head and the hydraulic conductivity. For two soils and given fluxes, pressure head profiles were calculated. For a given depth of the water table below the surface, there exists a maximum possible upward flux. Two types of downward flows are described. Either one of them may occur in the region above an interface between two different soil layers. (Knapp-USGS)
W73-11824

FIELD STUDIES ON SALT LEACHING IN A HIGHLY SALINE SODIC SOIL,
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and D. R. Bhumbla.
Soil Science, Vol 115, No 6, p 429-433, June 1973. 4 fig, 5 tab, 7 ref.

Descriptors: *Leaching, *Saline soils, Water spreading, Gypsum, Land reclamation, Soil management, Permeability, Soil investigations.

The effect on leaching of salt by continuous and intermittently ponded water, with or without the application of gypsum, was studied in a highly saline sodic soil. Gypsum greatly enhanced leaching of salts, but intermittent ponding had no particular advantage over continuous ponding treatments. This is caused by the low permeability of sodic soils which results in unsaturated water movement even under continuously ponded conditions. The salts underwent considerable dispersion and were distributed in a greater soil depth. This resulted from changes in the pore size distribution and resulting velocity distribution within the water flowing through soil pores. (Knapp-USGS)
W73-11835

IONIC MIGRATION AND WEATHERING IN FROZEN ANTARCTIC SOILS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 02K.
W73-11836

DEPTH INTERVALS AND TOPSOIL MOISTURE MEASUREMENT WITH THE NEUTRON DEPTH PROBE,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark).
K. J. Kristensen.
Nordic Hydrology, Vol 4, No 2, p 77-85, 1973. 3 fig, 2 tab, 12 ref.

Descriptors: *Nuclear moisture meters, *Soil moisture meters, Instrumentation, Calibrations, Moisture content, Soil water.
Identifiers: *Neutron meters.

A neutron depth probe was calibrated for soil layers of different thicknesses. For a 10-cm-thick layer of soil with the center of the instrument in the middle of the layer, about 40 to 70 percent of the response is caused by this particular layer at a water content of 8 to 40 percent by volume. For a 20-cm layer the response for similar conditions is about 65 to 85 percent. A special calibration function was calculated for the upper (0-20 cm) soil layer. The water content in this soil layer can be estimated in this way with about the same degree of accuracy as can be expected by conventional methods. (Knapp-USGS)
W73-11841

EFFECT OF EXCHANGEABLE SODIUM ON HYDRAULIC CONDUCTIVITY OF SOIL,
Uttar Pradesh Inst. of Agricultural Sciences, Kanpur (India).
V. K. Dixit, and R. N. Lal.
J Indian Soc Soil Sci. Vol 20, No 1, p 1-5, 1972.
Identifiers: *Hydraulic conductivity (Soils), *Sodium, Soils, *India, Clays.

Clay, clay loam, silty clay loam, silty loam and loam and loamy sand soils of U.P were incubated with Na2CO3 (O, 15, 25, 35, 45, 55 and 65% of CEC) in order to obtain increasing levels of exchangeable Na. An increase in exchangeable Na percentage (E.S.P.) was accompanied by a marked

decrease in hydraulic conductivity. The fractional changes in hydraulic conductivity (K/Kmax) were 0.85 at 5.01 E.S.P., 0.52 at 14.43 E.S.P., 0.21 at 24.50 E.S.P. and 0.06 at 29.88 E.S.P.--Copyright 1973, Biological Abstracts, Inc.
W73-11849

INVESTIGATION OF EFFECT OF SOIL FREEZING DEPTH AND OTHER FACTORS ON SNOWMELT RUNOFF ON RIVERS IN STEPPE AND FOREST-STEPPE ZONES (ISSLEDOVANIYE VLIYANIYA GLUBINY PROMERZANIYA POCHVY I DRUGIKH FAKTOROV NA TALYY STOK REK STEPNOY I L ESOSTEPNOY ZON),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-12055

SOIL WATER,

American Society of Agronomy and Soil Science Society of America: Madison, Wis., 175 p. Illus. 1972. D. R. Nielsen, editor. Pr. $8.50.
Identifiers: Books, Hydrodynamics, *Soil water, Temperature, Theoretical, *Soil properties.

Water flow in unsaturated soil is discussed. Subjects include: the solid and fluid properties of the soil-water system, theoretical analysis of soil-water potential, hydrodynamics, diffusion, dispersion and other physical properties, water movement under isothermal conditions, the effect of temperature on unsaturated soil water transport, and the isothermal flow of nonhomogeneous aqueous solutions. A variety of methods for field investigations on water flow in unsaturated soil, graphs, diagrams and tables are included.--Copyright 1972, Biological Abstracts, Inc.
W73-12171

MATRIC SUCTIONS TO WHICH SOILS IN SOUTH CENTRAL ENGLAND DRAIN,
Rothamsted Experimental Station, Harpenden (England).
R. Webster, and P. H. T. Beckett.
J Agric Sci. Vol 78, No 3, p 379-387. 1972. Illus.
Identifiers: Capacity, Drains, *England, *Matric suctions, *Soils.

In a survey of soils matric suctions were measured frequently during 1962 and 1963. Results for the period Oct.-May are given for sites lying above the influence of the regional ground water table and show the matric suctions to which the soils drain. Sandy soils drain within 2 or 3 days to a definite field capacity at about 50 mbar suction. Loams and clay loams, though from profile appearance regarded as freely drained, take up to about 1 wk to drain to fairly constant suction of 40-50 mbar, which can also be regarded as field capacity. However, suctions prevailing during this time are less - about 20 mbar. The prevailing suctions in clay soils are about 10 mbar in the topsoil (13 cm) and -10 mbar in the subsoil (38 cm). These soils drain slowly but steadily when rain ceases and no definite field capacity is evident. For sandy soils, loams and clay loams, the matric suctions characterize the upper limit of the available water capacity (AWC) of the soil. The values are less than almost all previous estimates or assumed values. For the clays the upper limit of AWC remains best estimated by field sampling at the time of interest.--Copyright 1972, Biological Abstracts, Inc.
W73-12172

SOIL CHANGES CAUSED BY EROSION CONTROL TREATMENTS ON A SALT DESERT AREA,
New Brunswick Univ., Fredericton. Dept. of Biology.
R. W. Wein, and N. E. West.
Soil Science Society of America, Proceedings, Vol. 37, No. 1. p. 98-103, January-February 1973. 2 fig., 3 tab., 26 ref.

Descriptors: *Soil investigations, *Saline soils, *Salt tolerance, *Soil water movement, *Sedimentation rates, Utah, Colorado River Basin, Furrow irrigation, Drainage engineering, Watersheds (basins), Bulk density, Desert plants, Deserts, Plant physiology, Soil types, Erosion control.
Identifiers: Upper Colorado River Basin, Salt Desert.

The Upper Colorado River Basin is comprised in part of 18 million acres of Utah's erosion-prone watershed. Although this area contributes only 5 percent of the water to the Colorado River, it contributes 44 percent of the sediment. This has resulted in inadequate drainage due to the filling of reservoirs, reducing storage capacity, and salt accumulation in the catchment basins of gully plugs and furrows. A comparison of Chipeta Series soil and an unnamed soil revealed that infiltration rates decreased in the Chipeta Series soil as clay accumulated on the gully plug floor so that during rainstorms the water supply was essentially sealed off from the subsoil, therefore evaporating into an arid environment. The salt buildup caused by slow infiltration appears to be inevitable. In the Chipeta Series soil, or in very saline soils, a salt buildup could occur before the gully plugs fill with sediment to a level where breaching occurs. The gully plug is essentially self destructive in soils of saline-sodic nature because the short term increase in vigor and density of native species is cancelled out by the loss of plants during construction and during the return to status quo. (Bahre-Arizona)
W73-12249

NUTRIENT AVAILABILITY IN DESERT GRASSLAND SOILS UNDER MESQUITE (PROSOPIS JULIFLORA) TREES AND ADJACENT OPEN AREAS,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 02I.
W73-12250

THE PREDICTION OF SOIL OCCURRENCE IN CERTAIN DESERT REGIONS OF THE SOUTHWESTERN UNITED STATES,
Soil Conservation Service, University Park, N. Mex.
L. H. Gile, and J. W. Hawley.
Soil Science Society of America, Proceedings, Vol. 36, No. 1, p. 119-124, January-February 1972. 3 fig., 1 tab., 22 ref.

Descriptors: *Soil formation, *Soil investigations, *New Mexico, *Maps, Soil analysis, Terrain analysis, Topographic mapping, On-site data collections, Sierozems, *Southwest US, Climatic data, Rio Grande River, Geologic formations, Flood plains.
Identifiers: Robledo Mountains, Rio Grande flood plain.

The Robledo Mountains and Rio Grande flood plain in New Mexico provide an on-site data collection base to determine soil genesis and soil distribution of extensive areas of desert soils in the southwestern United States. Analysis in terms of terrain, parent materials, range in age of soils, and general climatic history can be accomplished with the use of airphotos and geologic, topographic, and hydrologic maps. Topographic surveys reveal the carbonate content of parent materials, and determine the direction of soil development into Argids or soils other than Argids. Precipitation and dry dustfall provide important sources of calcium to the soils, preventing the development of argillic horizons. Soils without argillic horizons can also occur in low carbonate parent materials when the argillic horizon is obliterated. Physiographic position has implications for soil age and morphology. Both flood plains and steep slopes of strongly dissected terrains tend to be dominated by Entisols. These soils have weak or no genetic horizons and occur either in materials recently deposited or in old sediments recently exhumed. This is apparently due to low tables caused by downcutting of the Rio Grande. In contrast, soils of a stepped sequence of stable surfaces have progressively older and more complex soils with increasing elevation. (Bahre-Arizona)
W73-12256

IMPACT OF WETTING ON MICROBIAL RESPIRATION IN DESERT SOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
A. N. Macgregor.
Soil Science Society of America, Proceedings, vol. 36, p. 851-853, September-October 1972. 1 fig., 7 refs.

Descriptors: *Soil investigations, *Soil properties, *Soil gases, *Deserts, *Precipitation (Atmospheric), *Arizona, Soil microbiology, Carbon dioxide, Respiration, Sierozems, Arid lands, Soil temperature, Nitrogen, Wetting.
Identifiers: Sonoran Desert, *Tucson Basin.

Sonoita sandy loam (free of plant litter) was collected from the Santa Rita Mountains in the Tucson Basin to evaluate the response of normally arid soil to moisture, and consequent participation in soil nitrogen transformations. The response was immediate with carbon dioxide, identified as a major gas component, released in amounts equivalent to 50 microliters per gram of dry soil. The changes in carbon dioxide generation and exygen consumption provide an index of soil microbiological activity with an estimated ten-fold increase in carbon dioxide concentration following rainfall, while also temporarily increasing the photosynthetic efficiency of desert vegetation. Greatest influence on soil respiration is a 60 to 80 percent water holding capacity. Soil temperature may also affect rates of soil respiration; at high temperatures, nonbiological uptake of oxygen may be significant, but at 30 degrees C, approximately 90 percent or greater of the oxygen consumed by a soil is due to biological processes. The results of the investigation into the general physiology of indigenous microorganisms in virgin desert soil indicate that respiration may be attributed to an indigenous microflora fully adapted to an arid environment characterized by sustained dry periods, punctuated by brief wet periods. (Bahre-Arizona)
W73-12257

REACTIONS OF HERBICIDES WITH SOIL AND PLANTS,
Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
For primary bibliographic entry see Field 05B.
W73-12266

VARIABILITY OF THE SOIL WATER FLOW PARAMETERS AND THEIR EFFECT ON THE COMPUTATION OF RAINFALL EXCESS AND RUNOFF,
Agricultural Research Service, University Park, Pa. Northwest Watershed Research Center.
A. S. Rogowski.
In: Proceedings, (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December, 11-14, 1972. p 359-377, (1972). 7 fig, 2 tab, 14 ref.

Descriptors: *Variability, *Soil water, Flow, *Parametric hydrology, *Rainfall-runoff relationships, *Hydraulic conductivity, Evapotranspiration, Infiltration, Surface runoff, Hydrologic data, *Pennsylvania.
Identifiers: Land slope, Gradient.

This study illustrates the field distributions of hydraulic conductivity, potential gradient, and soil water content and examines their influence on the distributions of water flux, infiltration, and evapotranspiration. A 100 meter long experimental area located in the Ridge and Valley region of east central Pennsylvania was utilized. It is concluded that at low water contents, variability of the gradient accounts for most of the variability in the water flux. Close to saturation, however, ten fold variation mean flux is due principally to the variations in the conductivity. On the average, soil water was being removed by evapotranspiration three times as fast as could be supplied by upward flux. If the parameters and antecedent conditions for computing the rainfall excess were estimated from the distributions of hydraulic conductivity and soil water content, the results showed that, on the average, surface runoff is unlikely except on a small portion of an area and when the profile antecedent conditions come into prominence. (See also W73-12269) (Bell-Cornell)
W73-12291

THE TRANSFORMATION OF NITROGEN AND CARBON IN THE SOIL DURING HUMIFICATION OF STRAW LABELLED WITH N15,
Wyzsza Szkola Rolnicza, Poznan (Poland). Dept. of Plant Physiology.
D. Wojcik-Wojtkowiak.
Plant Soil. Vol 36, No 2, p 261-270. 1972. Illus.
Identifiers: Ammonium carbonate, *Carbon, Fulvic-Acid, Humic-Acid, *Humification, Nitrates, *Nitrogen, Nitrogen-15, Oat-M, Sodium nitrate, Soils, *Straw Transformation.

Laboratory tests were made on the effect of NaNO3 or (NH4)2CO3 on the dynamics of humification in the soil of oat straw tagged with N15. The mixture was incubated for 112 days, at constant temperature and moisture conditions. NH4-N accelerated the straw humifications more than NO3-N. Humification started directly after the straw was introduced into the soil. N15 derived from straw constituted a part of the forming humic compounds. Already after 14 days of incubation, the N15 of straw was found in all fractions of humic compounds. Mineralization accompanied humification. The added inorganic-N accelerated not only straw humification, but also the mineralization of forming humic compounds. This is why the added inorganic-N had no influence on the content of humic compounds. The decisive factor in the increase of humic and fulvic acids in the soil, was the straw. The inorganic-N added to the straw, had no influence on the quality of humic acids formed in the soil.--Copyright 1972, Biological Abstracts, Inc.
W73-12342

2H. Lakes

SYSTEMS ANALYSIS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 04A.
W73-11703

POPULATION BIOLOGY OF THE HELMINTH PARASITES OF PHOXINUS PHOXINUS (L.) THE MINNOW, IN A CARDIGANSHIRE LAKE,
Tobacco Research Council, Harrogate (England). Labs.
M. C. Bibby.
J Fish Biol. Vol 4, No 2, p 289-300. 1972. Illus.
Identifiers: Biology, Brains, Cariganshire (Wales), Diplostomum-Phoxini, *Helminth parasites, Infection, Intestine, Lakes, Ligula-Intestinalis, Macrolecithus-Papilliger, *Minnow, Neoechinorhynchus-Rutili, Parasites, *Phoxinus-Phoxinus, Population, Seasonal, *Wales (Frongoch Lake).

Specimens of P. phoxinus were collected over a period of 1 yr from Sept. 1967-Sept. 1968 from Frongoch Lake, Cardiganshire, Wales. Of a total of 650 fish examined for helminth parasites, 32% were definitive hosts for Macrolecithus papilliger, and 16.5% for Neoechinorhynchus rutili (Mueller), both parasites of the alimentary canal. All the fish examined were second intermediate host for Diplostomum phoxini (Faust) in the brain and 1.67% for Ligula intestinalis (L.) in the coelom. An increase in incidence of infestation with M. papilliger in spring and autumn and with N. rutili in summer were evident. The sex of the fish had no apparent effect on worm burden whereas size was more significant. There was a decrease in incidence of infestation with M. papilliger and an increase with N. rutili together with an increase in intensity of infestation with D. phoxini as the fish became larger. The latter species accumulated in the brain as the host increased in age.--Copyright 1972, Biological Abstracts, Inc.
W73-11716

INTRODUCTION OF KOKANEE SALMON (ONCORHYNCHUSNERKA) INTO LAKE HURON,
Department of Lands and Forests, South Baymouth (Ontario). Research Branch.
For primary bibliographic entry see Field 08I.
W73-11717

CRAYFISH FARMING IN THE UNITED STATES,
Louisiana State Univ., Baton Rouge. Fisheries Div.
For primary bibliographic entry see Field 06D.
W73-11848

MODELING IN THE EASTERN DECIDUOUS FOREST BIOME,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 02E.
W73-11907

A MODEL OF SEASONAL CHANGES IN TOTAL NITROGEN CONCENTRATION IN THE LAKE WINGRA WATER COLUMN,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 08B.
W73-11911

ZOOPLANKTON COMPOSITION AND CHANGE IN AN ALPINE LAKE,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11944

NET PLANKTON AND NANOPLANKTON PRODUCTION AND BIOMASS IN A NORTH TEMPERATE ZONE LAKE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11951

PRESERVING THE GREAT LAKES,
Resources Development Consultants, Inc. Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W73-11955

OCCURRENCE, DISTRIBUTION AND DENSITY OF RANGIA CUNEATA IN LAKES PONTCHARTRAIN AND MAUREPAS, LOUISIANA,
Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 05C.
W73-11957

EFFECTS OF ARTIFICIAL AERATION ON THE CHEMISTRY AND ALGAE OF TWO MICHIGAN LAKES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W73-11958

A SYNOPTIC STUDY OF FOOD HABITS OF 30 FISH SPECIES FROM WESTERN LAKE SUPERIOR,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
E. D. Anderson, and L. L. Smith, Jr.
Available from the National Technical Information Service as COM-72-11422, $3.00 in paper copy, $1.45 in microfiche. Minnesota Agricultural Experiment Station Technical Bulletin 279, 1971. 199p. 1 fig, 60 tab, 7 ref, appendix.

Descriptors: *Fish food organisms, *Food habits, *Fish, *Lake Superior, Synoptic analysis, Crustaceans, Amphipoda, Copepods, Insects, Mollusks, Fish eggs, Smelts, Herrings, Great Lakes, Darters, Lake trout, Cisco, Rainbow trout, Suckers, Sculpins, Sticklebacks, Perches, Walleye, Pikes, Yellow perch, Shiners.
Identifiers: *Western Lake Superior, Mysis, Apostle Islands (Wis), Duluth (Minn), Superior (Wis), Bloaters, Kiyis, Whitefish, Burbot, Alewife, Lake chub.

Food habits of western Lake Superior fish are described, food interrelationships of species evaluated, and ecological relationships are presented to serve as a starting point for future related studies of the various species. Fish were obtained at 17 stations during 28 sampling periods from September 1965-December 1968. Identification and enumeration of species were followed by preservation for future analysis. Stomachs from 5871 fish, including 30 species collected on 84 dates, were examined. Description of food habits indicates the preferences of the various species and reveals similarities in diet for many. Data indicate that crustaceans constitute the main diet for most species, at least during some phase of their life history; it was found that various species depend primarily on specific types of crustaceans, such as Mysis, amphipods, and copepods. Certain species also tend to rely heavily on insects, fish, molluscs, and fish eggs. Introduction and subsequent increase of smelt has had definite effects on the endemic species, evidenced by predominant percentage use of most food organisms by smelt, suggesting that the increase in smelts strongly influenced the decline of lake herring in western Lake Superior through food competition. (Jones-Wisconsin)
W73-11959

MCMULLEN V. RAMSEY STOCK FARMS, INC. (LANDOWNERS RIGHT TO DRAIN BOTTOMLANDS OR NON-NAVIGABLE LAKE).
For primary bibliographic entry see Field 06E.
W73-12001

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1971,
Geological Survey, Dallas, Tex. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-12038

REVISED FOOD CONSUMPTION ESTIMATE OF A BLUEGILL SUNFISH POPULATION IN WYLAND LAKE, INDIANA, USA,
Arizona State Univ., Tempe. Dept. of Zoology.
S. D. Gerking.
J Fish Biol, Vol 4, No 2, p 301-308, 1972, Illus.
Identifiers: *Bluegill sunfish, *Indiana (Wyland Lake), Lakes, Lepomis-macrochirus, Fish population, *Fish diet.

The estimate of food consumption by the bluegill sunfish (Lepomis macrochirus) population of Wyland Lake, Indiana, was examined with reference to recent research on the length of the growing season and the effect of body weight, ration and activity on growth efficiency. Growth efficiency was measured in the laboratory in terms of protein, comparing N assimilated with N accumulated over a period of about 30 days. The revised consumption of protein was 134.9 kg (or 1407 kg live weight of aquatic organisms, 444 kg/ha) during a growing season of 111 days compared with the original estimate of 127.3 kg calculated for an assumed growing season of 150 days, a difference of only 6%. The correspondence between the 2 estimates was coincidental. The original estimate was made at a time when the growing season had not been measured and the effect of ration and body size on growth efficiency was not precisely known. Corrections for these factors plus that for activity compensated for one another, closely approaching, by chance, the original value.--Copyright 1972, Biological Abstracts, Inc.
W73-12046

CURRENTS IN THE SHORE ZONE OF A NONTIDAL SEA (TECHENIYA BEREGOVOY ZONY BESPRILIVNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. F. Shadrin.
Izdatel'stvo 'Nauka', Moscow, 1972. 128 p.

Descriptors: *Currents (Water), *Ocean currents, *Shores, Littoral, Littoral drift, Rip currents, Waves (Water), Energy, Water circulation, Movement, Winds, Velocity, Flow, Hydrodynamics, Mathematics, Topography, Slopes.
Identifiers: Longshore currents, Compensation currents, Countercurrents, Navier-Stokes equations.

General concepts are presented of currents in the shore zone of seas and oceans. Longshore, compensation, and wind currents are described in connection with their role in the dynamics of the shore zone of a nontidal sea, and problems relating to the velocity field of currents are discussed. (Josefson-USGS)
W73-12060

SOME KINETIC ENERGY SPECTRA IN A NEARSHORE REGION OF LAKE ONTARIO,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 02E.
W73-12084

ECOLOGICAL STUDIES ON CRATER LAKES IN WEST CAMEROON FISHES OF BAROMBI, MBO,
British Museum of Natural History, London (England).
E. Trewavas, J. Green, and S. A. Corbet.
J Zool Proc Zool Soc Lond. Vol 167, No 1, p 41-95. 1972. Illus.
Identifiers: *West Cameroon, Crater lakes, Ecological studies, *Fishes, Genus, Konia, *Lakes, Myaka.

In the West Cameroonian crater lake, Barombi Mbo, and its inflowing stream there are 17 spp. of fishes, of which 12, including 11 cichlids, appear to be endemic. A systematic account is given of the endemics, including 4 new species and 2 new genera, KONIA and MYAKA. The ecology of the lake is described in relation to the feeding biology of the fishes, studied by underwater observation in the lake and the examination of stomach contents. The cichlids in Barombi Mbo probably evolved there from 2 or 3 ancentral populations and now show clear ecological separations in their feeding and breeding. The problem of speciation within the lake is of particular interest because of the apparent absence of physical barriers to account for the genetic isolation of incipient species.--Copyright 1972, Biological Abstracts, Inc.
W73-12168

SEASONAL PLANKTON CHANGES AND PRIMARY PRODUCTIVITY IN BEECH RESERVOIR,
Tennessee Valley Authority, Muscle Shoals, Ala.
M. P. Taylor.
J Tenn Acad Sci. Vol 47, No 3, p 103-111. 1972. Illus.
Identifiers: *Phyto-plankton, *Primary productivity, Reservoirs, Seasonal, *Tennessee (Beech Reservoir).

The Beech River drainage basin covers 302 square mi in west Tennessee and empties into Kentucky Lake at Tennessee River Mile (TRM) 136.0. Beech Reservoir, with a shoreline of 22 mi and a pool area of 347 ha is one of 8 reservoirs located in this drainage basin. In this study, phytoplankton productivity studies, phytoplankton standing crop and certain chemical analyses indicated that Beech is a more productive reservoir. Primary productivity values ranged from 85 mg C/m2/day in Feb to 5563 mg C/m2/day in Sept. The 9-mo. primary productivity mean was 1.619 mg C/m2/day. Chlorophyll a concentrations ranged from 14 mg/m2 in Aug. to 124 mg/m2 in March. Phytoplankton cell counts averaged 6,961,555/l. The major ionic change was shown when total Fe increased in the hypolimnion during April. Iron concentrations reached a maximum in Aug.--Copyright 1972, Biological Abstracts, Inc.
W73-12169

AN EVALUATION OF SELECTED MARKS AND TAGS FOR MARKING RECENTLY METAMORPHOSED SEA LAMPREYS,
Bur. Sport Fish. Wild., Hammond Bay Biol. Stn., Millersburg, Mich. Bureau of Sport Fisheries and Wildlife, Millersburg, Mich. Hammond Bay Biological Station.
L. H. Hanson.
Prog Fish-Cult. Vol. 34, No. 2, p 70-75. 1972 Illus.

Descriptors: *Dyes, gels-solvent, Lampreys, *Marking, Population dynamics, Tagging, *Sea lampreys (Metamorphosed), *Great Lakes.

A sutable method for marking recently metamorphosed sea lampreys is essential for understanding the population dynamics and determining the length of parasitic life, growth rates, and migratory patterns of adult sea lampreys in the Great Lakes. Such a mark should not encumber the lamprey, but must persist and be easily recognizable on fullgrown, sexually mature adults. Polyvinyl chloride loop tags, disc tags, thermal branding, fin cutting microtags, and the injection of various dye-gel and dye-solvent combinations were all tested and evaluated as potential marking techniques. It was determined that a fin-injection technique, using certain dye-gel or dye-solvent combinations, was an excellent method for marking sea lampreys. All other methods evaluated were unsatisfactory.--Copyright (c) 1972, Biological Abstracts, Inc.
W73-12251

GREAT LAKES WATER LEVELS, 1970, DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
National Ocean Survey, Detroit, Mich. Lake Survey Center.
For primary bibliographic entry see Field 07C.
W73-12298

REMOTE SENSING STUDY OF THERMAL DISCHARGES TO LAKE MICHIGAN, WISCONSIN, ILLIONOIS, INDIANA, AND MICHIGAN.
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-12309

STATE UNIVERSITY OF NEW YORK, COLLEGE AT PLATTSBURGH, LAKES AND RIVERS RESEARCH LABORATORY 1972 TECHNICAL REPORT.
For primary bibliographic entry see Field 05B.
W73-12321

TOXICITY OF LEAD NITRATE TO FIVE SPECIES OF FRESHWATER ALGAE,
State Univ. Coll., Plattsburgh, N.Y. Miner Inst. of Man and His Environment.
For primary bibliographic entry see Field 05C.
W73-12322

STUDIES ON THE SEASONAL AND SPATIAL DISTRIBUTION OF PHOSPHATES, NITRATES, AND SILICATES IN LAKE CHAMPLAIN,
State Univ. Coll., Plattsburgh, N.Y. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-12323

ORTHOPHOSPHATE CONCENTRATIONS AND DISTRIBUTIONS IN NORTHWEST BAY: 1971--1972,
For primary bibliographic entry see Field 05B.
W73-12324

MODULES FOR INTEGRATED AQUATIC MODELING,
For primary bibliographic entry see Field 05B.
W73-12325

A GENERAL MODEL FOR VERTICAL THERMAL STRATIFICATION IN ICE FREE LAKES,
State Univ. Coll., Plattsburgh, N.Y.
G. E. Myer.
In: State University of New York Lakes and Rivers Laboratory 1972, Technical Report, p 81-179, February 1973. 11 fig, 1 tab, 16 ref, 4 append.

Descriptors: *Mathematical models, *Lakes, *Simulation analysis, Computer programs, Model studies, Limnology, Heat flow, Stratification, Thermal stratification, Thermocline, *New York.
Identifiers: *Lake Champlain.

A general model was developed to simulate the vertical thermal development of most mid-latitude lakes during their ice free period. The model is based on the heat balance of lakes, including solar radiation, longwave radiation, latent heat exchange, sensible heat exchange, heat exchange with rivers, and heat exchange at the bottom of the lake. Vertical mixing is modeled in three ways to simulate mixing primarily caused by density instabilities, wind stress on the surface, and eddy diffusion. The model is written in the form of a FORTRAN computer program. The model was tested by simulating the thermal development of three lakes ranging in size from Lake Champlain, to Lower Chateaugay Lake, New York, which is only a few kilometers long. (See also W73-12321) (Knapp-USGS)
W73-12326

HYPSOMETRY OF LOWER CHATEAUGAY LAKE AND A POND ON THE SARANAC RIVER,
D. Hulbert, and G. Myer.
In: State University of New York Lakes and Rivers Research Laboratory 1972, Technical Report, p 180-186, February 1973. 4 fig, 2 tab.

Descriptors: *Hypsometric analysis, *Lake morphometry, *Bathymetry, *Mapping, Limnology, *New York.
Identifiers: *Chateaugay Lake (NY).

Lower Chateaugay Lake is a small lake about 3 km long 1309 ft above sea level in the Adirondack Mountains in New York State. The lake is relatively flat bottomed with relatively steeply sloped sides along the easterly and westerly shores. The northern and southern ends of the lake are comparatively shallow and show evidence of deposition of sediments. Rooted aquatic plants are numerous in these shallow regions. A hypsometry curve and a hypsometric map are presented. A small pond on the Saranac River is about 1 km long and is located near Plattsburgh, N.Y. This pond was formed by the flooding of a region on either side of the Saranac River behind a small dam owned by Georgia Pacific Paper Company and used for the generation of electric power. The river's channel through the pond can be seen easily in the hypsometric map. (See also W73-12321) (Knapp-USGS)
W73-12327

HYPSOMETRIC MAP OF HARRIS LAKE, NEW YORK,
State Univ. Coll., Plattsburgh, N.Y.
G. Myer, and A. Scarpinato.
In: State University of New York Lakes and Rivers Research Laboratory 1972, Technical Report, p 187-190, February 1973. 2 fig, 1 tab.

Descriptors: *Hypsometric analysis, *Lake morphometry, *Bathymetry, *Mapping, Limnology, *New York.
Identifiers: *Harris Lake (NY).

Harris Lake is a small elongate lake about 3 kilometers long located in the Adirondack Mountains of New York State. The shoreline of the lake is quite irregular and the main portion of the lake consists of two elongate basins which lay along a generally east-west line. A third smaller basin is connected to the south side of the lake. The hypsometric curve and a hypsometric map for the lake are presented. (See also W73-12321) (Knapp-USGS)
W73-12328

DISSOLVED ORGANIC MATTER IN NATURAL WATERS: A SELECTED BIBLIOGRAPHY, WITH EMPHASIS ON ANALYTICAL METHODS,
State Univ. Coll., Plattsburgh, N.Y. Dept. of Chemistry.
K. W. Loach.
In: State University of New York Lakes and Rivers Research Laboratory 1972, Technical Report, p 191-205, February 1973. 177 ref.

Descriptors: *Organic matter, *Bibliographies, Limnology, Ecology, Water pollution, Nutrients, Lakes, Trace elements, Surfactants.

This bibliography is a selection of references of interest to anyone wishing to do experimental work on the chemistry of dissolved organic matter (DOM). The references are classified under the following headings: occurrence of DOM in natural waters, conversions and interactions of DOM, surface-active effects of DOM, and interactions of DOM with trace metals. (See also W73-12321) (Knapp-USGS)
W73-12329

DIVERSITY AND ABUNDANCE OF AQUATIC INSECTS REDUCED BY INTRODUCTION OF THE FISH CLARIAS GARIEPINUS TO POOLS IN CENTRAL AFRICA,
Leicester Univ. (England). Dept. of Zoology.
J. S. Weir.
Biol Conserv, Vol 4, No 3, p 169-176, 1972.
Identifiers: Abundance, *Africa (Central), Aquatic insects, *Clarias-gariepinus, *Coleoptera, Diversity, Fish, *Hemiptera, Insects, Pools.

Dry-season collections of aquatic insects from two similar adjacent man-made pools in Rhodesia, one with and one without the omnivorous fish Clarias gariepinus, revealed large differences in numbers and species. Adult Hemiptera and Coleoptera (which breed during the wet season in numerous shallow ephemeral seasonal pools) dominated the fauna in both cases. Collections showed a reduction under predation from 2196 Hemiptera (15 spp.) to 51 (5 spp.), and from 1070 Coleoptera (31 spp.) to 15 (7 spp.). Predation is selective, certain common species becoming rare, and less common species disappearing. Other man-made pools showed similar differences. These insects normally spend the dry season concentrated in the few permanent pools which exist in river beds or in occasional permanent lakes, where there are structural refugia such as stones and reed-beds. The pools described here are structurally undifferentiated. Plant growth is suppressed, following heavy usage by mammal populations. Such pools with fish are false refugia. The creation of such pools or farm dams containing fish may have far-reaching effects on the aquatic fauna of other habitats. Fish productivity in pools might be increased by the presence of occasional pools without fish.--Copyright 1972, Biological Abstracts, Inc.
W73-12339

ON THE WATER QUALITY OF LAKE BIWA--KO AND THE INHABITABILITY OF THE BIVALVE, CORBICULA SANDAI, IN THE SETA RIVER, (IN JAPANESE),
Shiga Univ., Otsu (Japan). Faculty of Education.
For primary bibliographic entry see Field 05C.
W73-12344

THE LITTORAL FAUNA OF LLYN CELYN, NORTH WALES,
Liverpool Univ. (England). Dept. of Zoology.
P. C. Hunt, and J. W. Jones.
J Fish Biol. Vol 4, No 2, p 321-331. 1972. Illus.
Identifiers: Chironomidae, Fauna, *Littoral fauna, Lumbriculidae, North, Pisidium, Trout, *Wales (Llyn-Celyn), Reservoirs.

Water level fluctuations of up to 5.5 m in the newly constructed reservoir, Llyn Celyn, were shown to result in a uniformly barren littoral zone in which Lumbriculidae, Pisidium sp. and Chironomidae were the only animals to occur in significant numbers throughout the year. Other groups of animals were unable to survive the big fluctuations in water level and this in turn affected the food and growth of trout in the environment.--Copyright 1972, Biological Abstracts, Inc.
W73-12345

2I. Water in Plants

FOREST SOILS AND THE ASSOCIATED SOIL--PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith.
In: Proceedings of the Symposium on the Use of Isotopes and Radiation in Research on Soil-Plant Relationships Including Applications in Forestry, Dec. 13-17, 1971, Vienna. (IAEA-SM-151), International Atomic Energy Agency, Vienna, 1972, p 399-412. 4 tab, 19 ref.

Descriptors: *Soil water movement, *Soil-water-plant relationships, *Tracers, *Tritium, Phosphorus, radioisotopes, Forest soils, Coniferous forests, Snow management, Radioecology.

Coefficients for water-balance formulas based on the energy-balance approach can be estimated by using data on water movement determined by isotope tracers. Water movement through a pyroclastic soil of 41-66% porosity (12.2-30.5 cm/hr, the rate depending on the depth of the water table) was traced by tritium and P32. Water movement in red fir and lodgepole pine trees (0.3-1.3 cm/hr in winter; 1.5-2 m/hr in early spring when the soil was covered by snow) was traced by P32. Total water use by lodgepole pine (0.1 liter/hr for long-term movement in winter; 30.6 liters/hr for short-term movement in early spring) was estimated by combining rates and area of water movement within trees. (See also W72-10679) (Bopp-ORNL)
W73-11933

DISTRIBUTION AND AGE OF MARGARITIFERA MARGARITIFERA (L) IN A MADISON RIVER (MONTANA, USA) MUSSLE BED,
Washington Univ., Seattle. Fisheries Research Inst.
Q. J. Stober.
Malacologia. Vol 11, No 2, p 343-350, 1972. Illus.
Identifiers: Age, Distribution, Growth, Ligament, Margaritifera-Margaritifera, *Montana (Madison River), *Mussel beds, Rivers.

The distribution of M. margaritifera (L.) in a Madison River mussel bed 26 x 130 m was investigated during the winter of 1968. Mussels were concentrated in small scoured depressions and were not randomly distributed. They preferred stony bottom areas with sufficient water velocity to prevent deposition of sand, silt and detritus. The annuli in the ligaments of 4 relatively young mussels (ages 10, 11, 16 and 16 years) were measured and averaged to obtain a ligament growth curve for the Madison River population. Ages for 84 mussels were determined on the basis of this curve. The minimum and maximum ages were 10 and 67 years respectively, with an average of 47.9 years. Of 171 mussels examined, total length measurements of 86.5% were between 80 and 95 mm. The slope (0.745) of the regression of shell weight versus age was considered to reflect the average annual weight increase. A comparison of growth curves for the Madison River, Arctic, and Southern Sweden indicated that Madison River mussels grew at a faster rate than those collected in Sweden.--Copyright 1973, Biological Abstracts, Inc.
W73-12159

OBSERVATION ON THE SIMULATED EFFECTS OF RAIN ON LARVA OF NEODIPRION SWAINEI (HYMENOPTERA, DIPRIONIDAE),
British Columbia Univ., Vancouver. Dept. of Plant Science.
B. J. R. Philogene.
Can Entomol. Vol 104, No 6, p 895-596, 1972.
Identifiers: Diprionidae, Hymenoptera, Larva, *Neodiprion-Swainei, Pinus-Banksiana, *Rain, *Simulation.

Prolonged rainfall was simulated in the laboratory to evaluate the effect of precipitation on the mortality rate and larval development of N. swainei through maturity. A test group of larvae were subjected to 20 sec of sprinkling 5 times in the morning and 5 times in the afternoon until eonymph formation (temperature of 22C), 14 hr of light/day; control groups were raised under identical conditions without watering. Intermittent watering was harmful to development: the test larvae took more time to reach the eonymphal state and died in larger numbers than the controls. This higher mortality was above all an effect of the impact of water on the individuals. The larvae that died were dislodged from Pinus banksiana Lamb. branches on which they were raised (after the third larval stage) by water droplets and once they were on the ground they were exposed to more water than the larvae left attached to the pine needles. They appeared incapable of climbing back and died of inanition. Post-eonymphal development and female fecundity of individuals exposed to watering but

that were not dislodged did not significantly differ from that of eonymphs developing from watered larvae. In fact, watered individuals of one of the larval collection sites presented higher fecundity. The observations reported indicated the reduction of this pest during abundant and continuous rains. Even higher reduction could occur with temperatures lower than 22C during periods of larval development and female fecundity since temperature and humidity generally work together.--Copyright 1973, Biological Abstracts, Inc.
W73-12160

STUDIES OF THE SPRAY ZONE OF CHURCHILL FALLS, LABRADOR,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
G. R. Brassard, S. Frost, M. Laird, O. A. Olsen, and D. H. Steele.
Biol Conserv Vol 4, No 1, p 13-18. 1971. Illus.
Identifiers: *Bryophytes, Canada, *Labrador (Churchill Falls), Parasites, Pathogens (Black fly), *Spray Zones (Falls).

In 1970, with the cooperation of the Churchill Falls (Labrador) Corporation Limited, an intensive biological research program was started in the Churchill Falls area. The initial objective is to study the spray zone of the Falls before it is altered by the diversion of the Churchill River. Spray from the Falls is apparently responsible for the maintenance of 3 spray pools and for the enriched flora and vegetation in the spray zone, which contains an abundance of moisture-loving plants. The vegetation shows abrupt changes with exposure to spray and there is a general retardation of the phenology. The forest in the spray zone is luxuriant in comparison with that outside the spray's influence. Bryophytes are the dominant cryptogams of the zone and have a high percentage fertility there. Permanent quadrats have been set up to monitor succession in typical sprayzone bryophyte communities. Work was also begun on blackfly pathogens and parasites. An intensified research program is being continued on the spray zone and surrounding area by Memorial University through 1971 and hopefully in subsequent years.--Copyright 1972, Biological Abstracts, Inc.
W73-12162

SOIL PHYSICAL CONDITIONS AFFECTING SEEDLING ROOT GROWTH: II. MECHANICAL IMPEDANCE, AERATION AND MOISTURE AVAILABILITY AS INFLUENCED BY GRAIN-SIZE DISTRIBUTION AND MOISTURE CONTENT IN SILICA SANDS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Soil Science.
B. C. Warnaars, and B. W. Favis.
Plant Soil. Vol 36, No 3, p 623-634. 1972. Illus.
Identifiers: *Aeration, Availability, Corn-M, Distribution, Grain, Grass-M, Impedance (Mechanical), *Moisture, Pea-D, *Root growth, Sands, Seedling, Silica, *Soil physical properties.

Pea, corn, and grass seedling root growth in 5 sands varying in grain-size distribution, packed dry and then maintained at 6 matric potentials, varied according to mechanical impedance and aeration. Mechanical impedance restricted root elongation in every treatment including the finer dryer sands in which longest roots were found, but it was greatest in the coarse sands, where crooked swollen roots similar in shape to the pore channels were produced. Straight evenly tapered roots were formed in the fine sands due to a more balanced stress distribution over the root tip. Interpretations of penetrometer measurements differed in coarse and fine sands. 'Aeration effects' were distinguished from mechanical impedance effects by comparing the root lengths expected (mechanical impedance acting singly) with those actually obtained (mechanical impedance and aeration acting together), and they occurred in sands with less than 25% gas-filled pore space. No effect due to water availability could be found.--Copyright 1972, Biological Abstracts, Inc.
W73-12163

ALKALI BULRUSH SEED GERMINATION AND CULTURE,
Bureau of Sport Fisheries and Wildlife, Tulelake, Calif.
E. J. O'Neill.
J Wildl Manage. Vol 36, No 2, p 649-652. 1972. Illus.
Identifiers: *Alkali bulrush-M, *California (Tulelake), Cultures, Dormancy, *Germination (Seed), Plastic sheeting, Scirpus-Paludosus-M, Seeds, Shorelines, Sodium hypochlorite.

Several hundred acres of alkali bulrush (Scirpus paludosus) were successfully seeded and propagated near Tulelake, California, after a technique was developed for breaking the seed dormancy, employing use of sodium hypochlorite, water, transparent plastic sheeting, and direct sunshine for several days. The pregermination process presents a method that can be accommodate large amounts of seed for bulk aerial or broad-casting seeding in situations similar to shallow, flooded rice fields or wet shoreline units.--Copyright 1972, Biological Abstracts, Inc.
W73-12165

A SEASONAL STUDY OF THE VEGETATION ON LEVEES,
Louisiana State Univ., New Orleans. Dept. of Biological Sciences.
G. N. Montz.
Castanea. Vol 37, No 2, p 140-146. 1972.
Identifiers: Levees, Mississippi River, *Seasonal, Species, *Vegetation, *Louisiana.

The frequency and perdentage composition of plants were determined on levees in East St. Charles Parish (County), Louisiana. This parish is west of New Orleans and is bounded on the south by the Mississippi River and on the north by Lake Pontchartrain. The vegetation was sampled by 55 line transects at the same locations in Feb-March, May-June and Aug-Sept. Eighty-nine species were recorded. Field notes indicate vernal, estival and autumnal flowering periods in the area. Eleven species were noted to flower only in the Feb-March study, 6 species only in the May-June study and 8 species only in the Aug-Sept study.--Copyright 1972, Biological Abstracts, Inc.
W73-12166

FISH SPECIES DIVERSITY IN RELATION TO STREAM ORDER AND PHYSICOCHEMICAL CONDITIONS IN THE PLUM CREEK DRAINAGE BASIN,
Southwest Texas State Univ., San Marcos. Aquatic Station.
B. G. Whiteside, and R. M. McNatt.
Am Midland Nat. Vol 88, No 1, p 90-101. 1972.
Identifiers: *Drainage basins, *Fish species, Physicochemical, Plum Creek (Tex), Species diversity, Streams, *Texas.

Water and fish samples were collected at 202 sampling stations throughout the Plum Creek drainage basin in south central Texas between Jan. and April 1968. Fish species diversity (D) was analyzed to determine its relationship to stream order and physicochemical conditions. Fluctuations in physicochemical conditions decreased as stream order increased. Twenty-seven spp. of fishes were collected. Minimum, maximum and mean numbers of species per stream increased as stream order increased through the first 4 stream orders and decreased in the 5th-order stream. Mean D values decreased from first-order to second-order streams, then increased through 4th-order streams; and decreased again in the 5th-order stream. Cumulative D values increased through 3rd-order streams and decreased in 4th-and 5th-order streams. In general, D values for adventitious streams correlated with trends in D values for the higher order stream into which the adventitious stream flowed. The decrease in number of species and in species diversity in the 5th-order stream may have been due to migration of fishes into lower order streams for spawning purposes and/or to escape abnormally high water in the 5th-order stream. Also, increased depth and obstacles, such s logs and barbed wire, may have reduced seining efficiency in the 5th-order stream.--Copyright 1972, Biological Abstracts, Inc.
W73-12167

BUTOMUS UMBELLATUS IN THE MISSISSIPPI WATERSHED,
Ohio State Univ., Columbus. Dept. of Botany.
M. L. Roberts.
Castanea. Vol 37, No 2, p 83-85. 1972.
Identifiers: *Butomus-Umbellatus-M, Missippissi watershed, *Ohio, Rivers, Survey, Watersheds, *Scioto River (Ohio).

B. umbellatus L. is reported from the Olentangy and Scioto Rivers in central Ohio. Results of a river survey indicate it will probably spread downstream in the Scioto River and into the other parts of the Mississippi watershed.--Copyright 1972, Biological Abstracts, Inc.
W73-12176

MORPHOLOGY, LIFE HISTORY, AND ECOLOGY OF AN UNUSUAL STICKLEBACK (GASTEROSTEUS ACULEATUS) IN THE QUEEN CHARLOTTE ISLANDS, CANADA,
Winnipeg Univ., Manitoba. Dept. of Biology.
G. E. E. Moodie.
Can J Zool. Vol 50, No 6, p 721-732. 1972. Illus.
Identifiers: Breeding, *Canada (Queen Charlotte Island), Ecology, Gasterosteus-Aculeatus, Islands, Life history, Morphology, Phenotypes, *Stickleback.

In Mayer Lake Black sticklebacks shared an exposed environment with several predatory fish, whereas leiurus, the typical freshwater form of G. aculeatus, was the only fish inhabiting the vegetation-choked margins of the inlet streams and stream mouths. Black sticklebacks and, to a lesser extent, leiurus were seldom collected outside their respective habitats. Breeding Black males were probably at least 2 yr old. They preferred to nest near vegetation, on sandy, gently sloping substrates. The length of the breeding season and the number of breeding cycles in the season were similar to those of other populations. Males of different phenotypes appeared to nest in habitats differing in water depth and proximity to shelter. Some difference in habitat of the nest site were seemingly correlated with breeding success. Black sticklebacks are distinguished from leiurus by their large size and pelvic spines; high gill raker, vertebral and lateral plate counts; streamlined shape; melanism and drab breeding colors. Black sticklebacks probably meet the requirements of a biologically defined species.--Copyright 1972, Biological Abstracts, Inc.
W73-12177

PREDATION, NATURAL SELECTION AND ADAPTATION IN AN UNUSUAL THREESPINE STICKLEBACK,
Winnipeg Univ., Manitoba. Dept. of Biology.
G. E. E. Moodie.
Heredity. Vol 28, No 2, p 155-167. 1972. Illus.
Identifiers: Adaptation, Gasterosteus-Aculeatus, *Natural selection, *Predation, *Stickleback (Threespine), Trout, Canada.

In Mayer Lake Gasterosteus aculeatus exists as 2 forms or 'races.' The Black form is subject to predation by 3 species. The leiurus form, restricted to the inlet streams and stream margins, has no known predators. Predator choice tests sug-

gested that Black males which develop red throats are more liable to predation than males without red throats. Black females taken from trout stomachs had significantly shorter spines than females netted in the lake. Significantly more fish with 8 lateral plates were eaten by trout than was expected on the basis of their frequency in the population. The large size of Black sticklebacks may provide various defenses against predators.--Copyright 1972, Biological Abstracts, Inc.
W73-12178

AN ANALYSIS OF MORPHOLOGICAL VARIATION: A COMPARISON OF SOME STREAM--DWELLING FISHES,
Illinois Univ., Champaign. Dept. of Zoology.
R. J. Lederer, and L. Verner.
Trans Ill State Acad Sci. Vol 65, No 1/2, p 26-32. 1972.
Identifiers: *Fishes (Teleost), *Morphological studies, Niches, Streams.

Nine spp. of (teleost) fish from 2 different streams are compared with respect to variation of some non-meristic characters. It appears that pelagic species are more variable than benthic ones and that differences in morphological variation may reflect niche size differences.--Copyright 1972, Biological Abstracts, Inc.
W73-12179

INTERSPECIFIC INTERACTIONS AND LIMITING FACTORS OF ABUNDANCE AND DISTRIBUTION IN THE RED RIVER PUPFISH, CYPRINODON RUBROFLUVIATILIS,
Oklahoma Univ., Willis. Biological Station.
A. A. Echelle, A. F. Echelle, and L. G. Hill.
Am Midland Nat. Vol 88, No 1, p 109-130. 1972. Illus.

Descriptors: *Abundance (Pupfish), Cyprinodon-rubrofluviatilis, *Distribution (Pupfish), Fundulus-zebrinus, Gambusia-affinis, Hybognathus-placitus, Lepomis-spp, Notropis-bairdi, Notropis-lutrensis, Pimephales-spp, *Pupfish (Red River).

C. rubrofluviatilis, was positively associated in occurrence with Fundulus zebrinus, Hybognathus placitus and Notropis bairdi and negatively associated with a large, predominantly freshwater (salinity < 10 ppt) complex composed of Notropis lutrensis, Gambusia affinis, Lepomis spp. and Pimephales ssp. Although occurring in dilute waters, the pupfish was virtually restricted to saline conditions (salinity>10 ppt) where few other species occurred. An apparent lack of intrinsic limiting factors was demonstrated. The pupfish seems adapted to a broad ecological niche, creating competition with an array of freshwater forms that are better adapted to exist in richer faunas. A W to E filter-bridge based on decreasing numbers of saline streams seems to be the major factor limiting eastward distribution of the pupfish. Competition and direct behavioral interaction with the pupfish seemed to be major factors depressing F. zebrinus populations in saline waters. A variety of broad adaptations of the pupfish may help to confer a numbers advantage over F. zebrinus, magnifying the effects of behavioral interaction. These effects may also help make the pupfish successful at moderate salinities (10-20 ppt) where there are at least 12 potentially competing species.--Copyright 1972, Biological Abstracts, Inc.
W73-12181

FOOD, FEEDING SELECTIVITY AND ECOLOGICAL EFFICIENCIES OF FUNDULUS NOTATUS (CYPRINODONTIDAE),
Environmental Control Corp., Painesville, Ohio.
G. L. Atmar, and K. W. Stewart.
Am Midland Nat. Vol 88, No 1, p 76-89. 1972. Illus.
Identifiers: Aquatic algae, Arthropods, Chironomid, Crustaceans, *Cyprinodontidae, Ecological efficiencies, *Feeding selectivity, *Food, Fundulus-Notatus, Insects, Snails.

Terrestrial arthropods formed 41% of the diet of field-collected black-stripe top minnow, with a consistent Electivity Index (E) value of positive-one; snails, aquatic insects and microcrustaceans, respectively, occupied 19%, 16% and 10% of the diet. Positive E values were maintained for aquatic insects except in stagnant pools where interspecific fish competition probably occurred. Crustaceans assumed negative E values except in a single habitat, while snails took positive E values only in stagnant pools. Top minnows smaller than 38 mm, S.L. (standard length), supplemented terrestrial arthropods with microcrustaceans for 28% of their ration; crustaceans decreased and aquatic insects increased in relative importance as fish size increased. Algae were ingested with 41% frequency, but apparently not digested. Fishes in feeding experiments showed a preference for chironomid larvae but an electivity for floating, terrestrial insects, which were readily available Physid snails, with 42% frequency of occurrence in field-collected fishes, were avoided in the presence of abundant alternative prey. Assimilation efficiency was 97% for all size classes of top minnows. Two minnows of 48 to 65 mm S.L. had a lower ecological growth efficiency (5.9%) than smaller fishes (8.5%). The average daily energy expenditure for 48 to 65 mm fishes was lower, 20 cal x g of initial dry wt-1 (gWo-1), than the 55 cal x gWo-1 for fishes smaller than 48 mm, S.L.: but the net efficiency of food utilization for growth in the latter (21.6%) was not significantly higher than that in 48 to 65 mm fishes (15.0%). F. notatus facilitates the entrance of allochthonous organic material into the ecosystem by digesting and defecating the remains of terrestrial arthropods, and it indirectly taps the flow of matter and energy from allochthonous plant sources by preying upon aquatic insect detritus-feeders, getting more than one-half of its ration directly or indirectly from basically allochthonous sources. It also functions as a 3rd- or 4th-level predator.--Copyright 1972, Biological Abstracts, Inc.
W73-12184

HABITAT SELECTION AND SPATIAL INTERACTION BY JUVENILE CHINOOK SALMON AND STEELHEAD TROUT IN TWO IDAHO STREAMS,
Oregon State Game Commission, Corvallis; and Oregon State Univ., Corvallis.
F. H. Everest.
J Fish Res Board Can. Vol 29, No 1, p 91-100. 1972 Illus.
Identifiers: Allopatry, *Chinook salmon, *Idaho, Juveniles, Oncorhynchus-Tshawytscha, Salmo-Gairdneri, Salmon, *Steelhead trout, Streams, Sympatry, Trout, Fish habitats.

During summer sympatric steelhead trout (Salmo gairdneri) and summer chinook salmon (Oncorhynchus tshawytscha) segregated in Crooked Fork and Johnson creeks. In short-term allopatry, each species occupied the same types of habitat as in sympatry. Most age 0 steelhead lived over rubble substrate in water velocities and depths of less than 0.15 m/sec and 0.15, respectively; most age 0 chinook lived over silt substrate in water velocities of less than 0.15 m/sec and depths of 0.15-0.3 m/sec (near bottom) and 0.75-0.9 m/sec (near surface), and in depths of 0.6-0.75 m. As fish of each species became larger they moved into faster, deeper water. Juvenile chinook and steelhead of the same size used the same physical space. But steelhead spawn in spring and chinook spawn in early fall, and disparate times of spawning create discrete intra- and inter-specific size groups of pre-smolts. The size differences minimize potential for social inter-action, both intra- and inter-specific. Copyright (c) 1972, Biological Abstracts, Inc.
W73-12245

PATTERNS OF WATER MOVEMENT IN TREES AND SHRUBS,
Tel Aviv Univ. (Israel). Dept. of Botany.
Y. Waisel, N. Liphschitz, and Z. Kuller.
Ecology, Vol. 53, No. 3, p. 520-523, Late Spring 1972. 8 fig., 1 tab., 23 ref.

Descriptors: *Plant physiology, *Desert plants, *Stemflow, Systematics, Arid climates, Semiarid climates, Shrubs, Water storage, Xylem, Dye dispersion, Sites, On-site data collections.

Paths of water flow were examined in chamaephytes and phanerophytes, either of Mediterranean or desert chorotype, with injected dyes. All shrubs possessed the same sectoral pattern of dye ascent, but two shrubs of Chenopodiaceae family also exhibited an interlocked system. This pattern seems to be characteristic of the family and independent of the plants' ecological group. The interlocked system is common in trees from drier sites. A three year investigation found sectoral ascent of water in all aged shrubs, wheras young shrubs exhibited a sectorial turning into a ring ascent. Patterns of water movement differed in the various tree species, with large and tall crown species showing either a spiral pattern or a sectorial straight pattern turning into a ring pattern of ascent, while other species exhibited a sectorial straight pattern. The ascent pattern did not differ in two groups of Populus euphratica trees, although the location site of one was wet, while the other occurred on a dry and saline site. Differences in patterns of water movement were correlated either with differences in xylem structure, or with various ecological conditions prevailing in the habitat, indicating a pattern valuable under dry conditions. The appearance of a sectorial pattern in shrubs and tree-like shrubs suggests a survival value during water shortage. Knowledge of water movements in stems may also provide a useful distinctive criterion towards the differentiation between the two main life forms of woody plants. (Bahre-Arizona)
W73-12246

DROUGHT EFFECTS ON A SEMIDESERT GRASSLAND RANGE,
Agricultural Research Service, Las Cruces, N. Mex. Plant Science Research Div.
C. H. Herbel, F. N. Ares, and R. A. Wright.
Ecology, Vol. 53, No. 6, p. 1084-1093, Autumn 1972. 2 fig., 2 tab., 25 ref.

Descriptors: *Plant growth, *Succession, *Drought resistance, *Grasslands, *New Mexico, On-site data collections, Soil water movement, Mesquite, Effective precipitation, Soil types, Caliche, Droughts, Invasion, Climatic data.

A vegetational survey conducted on the Jornada Experimental Range in southern New Mexico indicated that drought occurrence is more frequent in areas that have minimal, rather than optimal, precipitation and may lead to severe reductions in plant yields in the areas of minimal precipitation. Data taken annually from 1941 through 1957 provided the basis for a study of the effects of the great drought of 1951 through 1956. Observation of cover and yields, based on a consideration of landform and soil characteristics, indicates a successional change of cover as drought modifies growth patterns. Drought damage was much more severe on the deep sands where the impermeable caliche layer occurred at greater depths, whereas moisture relations were better in shallow sands. Thinned grasslands were invaded by Prosopis juliflora; however, grass losses were held to a minimum with winter-spring and summer precipitation. Tabulated data indicate that annual and seasonal (July-December) precipitation for the 1951-56 period was about 55 percent of the 1941-1950 averages with the most severe drought years being 1951, 1953, and 1956. (Bahre-Arizona)
W73-12247

NUTRIENT AVAILABILITY IN DESERT GRASSLAND SOILS UNDER MESQUITE

(PROSOPIS JULIFLORA) TREES AND ADJACENT OPEN AREAS,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
A. R. Tiedemann, and J. O. Klemmedson.
Soil Science Society of America, Proceedings, Vol. 37, No. 1, p. 107-111, January-February 1973. 1 fig., 2 tab., 22 ref.

Descriptors: *Soil investigations, *Microenvironment, *Grasslands, *Plant growth, *Arizona, Forage grasses, Moisture uptake, Germination, Grasses, Vegetation establishment, Desert plants, Mesquite, Nutrient requirements, Indicators, Plant physiology, On-site investigations, Nitrogen, Phosphorus, Potassium, Sulfur.

A pot-culture technique was used to evaluate the supply of available soil nutrients, using as indicator plants, three native perennial grasses which are most abundant under mesquite (Prosopis juliflora (Swartz.)DC) trees: Arizona cottontop (Trichachne californica (Benth.)Chase), plains bristlegrass (Seteria macrostachya H.B.K.), and bush muhly (Muhlenbergia porteri (Scribn.)). The availability of soil nutrients and the measurement of relative yields of grasses were compared with the availability of nitrogen, phosphorus, potassium, and sulfur, in soil under mesquite trees and adjacent open areas on a desert grassland site. Results minimize the effect of moisture competition between mesquite trees and perennial grasses in explaining meager growth of forage in open areas between mesquite. A low supply of soil nutrients in soil beyond the mesquite trees limits forage production, and indicates that even with check treatment and adequate moisture, the stunted chlorotic appearance of Arizona cottontop and plains bristlegrass, plants would not change. Germination of these seeds in open areas between mesquite trees would be difficult, and moisture stress conditions in desert grassland would probably further restrict establishment. Germination of seed in mesquite soil would mean a much better chance of becoming established because of a more favorable nutrient regime. (Bahre-Arizona)
W73-12250

WATER-STRESS PATTERNS IN HONEY MESQUITE,
Texas A and M Univ., College Station. Dept. of Range Science.
R. H. Haas, and J. D. Dodd.
Ecology, Vol. 53, No. 4, p. 674-680, Summer 1972. 6 fig., 3 tab., 21 ref.

Descriptors: *Mesquite, *Soil water, *Moisture stress, *Drought tolerance, *Evapotranspiration, Southwest U.S., Semiarid climates, Soil-water-plant relationships, Drought resistance, Leaves, Evaporation, Pressure measuring instruments, Diurnal, Environmental effects, Moisture uptake, Soil moisture.

Honey mesquite, Prosopis glandulosa var. glandulosa Torr., is an extravagant user of readily available soil water, and its persistence on the semiarid rangelands of the southwestern United States suggests that the plant's existence is dependent upon survival during periods of drought. Water use per leaf area in this plant has been found to diminish when the evaporative demand of the atmosphere exceeds the rate of water absorption, suggesting the existence of a drought-endurance mechanism. A lack of available information on the degree of water stress imposed by the high water-demand conditions led to this study in which water stress (as leaf water potential, LWP) was measured in honey mesquite by using the pressure-chamber method to detect negative hydrostatic pressure in the xylem of leaf petioles. Mean differences between sun-exposed and shaded leaves averaged 4.7 bars LWP on a clear day in May. Diurnal changes in LWP, often greater than 20 bars, were associated with changes in the evaporative potential of the atmosphere. Total daily water stress and net daily water stress were calulated by intergrating the area under a curve formed by the periodic measurements of LWP during the diurnal period. Net daily water stress was more sensitive to changes in environmental variables than other daily summaries. Throughout the range of available soil moisture there was a close relationship between net daily water stress and the integrated evaporative potential on a daily basis. (Gloyd-Arizona)
W73-12252

ECOLOGY OF INDIAN DESERT. VIII: ON THE WATER RELATIONS AND ASSIMILATE BALANCE OF SOME DESERT PLANTS,
Jodphur Univ. (India). Dept. of Botany.
T. Mathur, and D. N. Sen.
Annals of Arid Zone, Vol 11, Nos 1/2, p 18-30, March/June 1972, 10 fig, 3 tab, 16 ref.

Descriptors: *Soil-water-plant relationships, *Xerophytes, *Leaves, *Moisture stress, *Plant physiology, Mesquite, Soil water, Water loss, Stomata, Desert plants.
Identifiers: *India, Rajasthan Desert, Calotrope, Tephrosia.

Four species of xerophytes prevalent in the Rajasthan Desert, India, were studied to determine the mechanisms governing water loss, stomatal behavior, and relative water content of plant material, the latter being the ratio of water content in the field to that after plant material has been allowed to make up any deficity expressed as percentage. Tables show water loss by species by month, absolute moisture of leaf during different hours of the day during different months, presence of polysaccharides by species and month, nitrogen content of leaves by species and month. Species differed in their ability to withstand drought for their survival under xeric conditions, although all restricted loss of water substantially by keeping stomata partially closed. Percentage of absolute moisture in the calotropes was found to be maximum, possibly because of latex; it was minimum in the mesquite. Percentage of relative water content of the mesquite and the tephrosia decreased, but in the calotropes increased with decrease in soil moisture. (Paylore-Arizona)
W73-12254

BRYOPHYTES AS A GUIDE TO MINERALISATION,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry and Biochemistry.
R. R. Brooks.
N Z J Bot, Vol 9, No 4, p 674-677, 1971.
Identifiers: Aquatic plants, *Bryophytes, Copper mosses, Exploration, Growth, Merceya, Mielichhoferia, *Minerals, Mineralization, *Mosses, Streams, Uranium, *New Zealand.

The use of bryophytes in mineral exploration is reviewed. 'Copper mosses,' mainly members of the genera Merceya and Mielichhoferia, grow preferentially over substrates with high Cu concentrations. Examination of the collection locality in herbarium specimens and subsequent exploration of this locality by conventional methods of mineral exploration can sometimes lead to discoveries of mineralization. In New Zealand, aquatic bryophytes have been used in the search for uranium, since they concentrate this element from streams draining uraniferous areas.--Copyright 1972, Biological Abstracts, Inc.
W73-12337

OBSERVATIONS ON PARAMECIUM OCCUPYING ARBOREAL STANDING WATER IN COSTA RICA,
Michigan Univ., Ann Arbor. Dept. of Zoology.
J. Vandermeer, J. Addicott, A. Andersen, J. Kitasako, and D. Pearson.
Ecology, Vol 53, No 2, p 291-293, 1972.
Identifiers: *Costa Rica, Distribution, Heliconia-M, *Mosquitos, *Paramecium, Standing water (Arboreal).

Some observations on the natural history of the Paramecium-Heliconia system are presented. The pattern of distribution in the wet season seems to be either a random colonization or a colonizing bias toward younger bracts, but ultimately the mosquito larvae in the older bracts build up, resulting in death of the local Paramecium population. The dry season pattern appears to be different at least in that there are very few mosquito larvae. The observation of Maguire and Belk (1967) that Paramecium do not occur in bromeliads was repeated. Experiments were performed demonstrating that if Paramecium do get to bromeliads, the biological interactions between the Paramecium and the regular microfauna of the bromeliad are such that the Paramecium are driven to extinction.--Copyright 1972, Biological Abstracts, Inc.
W73-12340

PRODUCTION OF FISH IN TWO SMALL STREAMS IN THE NORTH ISLAND OF NEW ZEALAND,
Marine Dept., Wellington (New Zealand). Fisheries Research Div.
C. L. Hopkins.
N Z J Mar Freshwater Res. Vol 5, No 2, p 280-290. 1971. Illus.
Identifiers: Anguilla-Australis-Schmidtii, Anguilla-Dieffenbachii, Diptera, Ephemeroptera, *Fish production, Galaxias-Divergens, Islands, *New Zealand, North, Philypnodon-Breviceps, Salmo-Trutta, Small streams.

Data are presented on biomass, mortality, growth, and production of fish populations inhabiting 2 small streams in the Wairarapa district of the North Island of New Zealand. The main water of both streams contained a mixed population of bullies (Philypnodon breviceps Stokell), brown trout (Salmo trutta Linn.), and eels (Anguilla dieffenbachii Gray, and A. australis schmidtii Phillipps). The headwater tributaries of one of the streams contained a large population of Galaxias divergens Stokell and a few eels, but other fish species were absent. All species of fish appeared to be using the same food supply of small benthic invertebrates, mainly ephemeropteran and dipteran larvae. Biomass of benthos per unit area was appreciably higher in the headwater tributary examined than in the main waters downstream. Mean annual stock of benthos in the tributary (Hinau north branch) was 19.75 g/m2, in the Hinau main water 10.71 g/m2 and in the Hinaki main water 13.47 g/m2. Nevertheless, production per unit area from the nearly monospecific fish population in the Hinau north branch (14.28 g/m2) was less than that of the mixed populations in the waters (24.17 g/m2 in the Hinau, 73.54 g/m2 in the Hanaki). Possibly fish production in the headwaters might be greater if the species composition of fish was more diverse.--Copyright 1972, Biological Abstracts, Inc.
W73-12347

2J. Erosion and Sedimentation

CRITERIA FOR STABLE EARTH CHANNEL DESIGN,
Soil Conservation Service, Upper Darby, Pa.
For primary bibliographic entry see Field 08B.
W73-11746

ICEFIELD RANGES RESEARCH PROJECT SCIENTIFIC RESULTS, VOLUME 3.
For primary bibliographic entry see Field 02C.
W73-11790

SOME ASPECTS OF THE GEOMORPHOLOGY OF MELTWATER STREAMS, STEELE GLACIER TERMINUS,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 02C.
W73-11794

OBSERVATIONS ON AN ALPINE MUDFLOW, STEELE CREEK,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 02C.
W73-11795

UP-HEAVED BLOCKS: A CURIOUS FEATURE OF INSTABILITY IN THE TUNDRA,
Portland State Univ., Oreg. Dept. of Geography.
For primary bibliographic entry see Field 02C.
W73-11807

THE SEDIMENTOLOGY OF A BRAIDED RIVER,
Ottawa Univ. (Ontario). Dept. of Geology.
P. F. Williams, and B. R. Rust.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 183-210, 1972. 28 fig, 5 tab, 20 ref, append.

Descriptors: *Sedimentation, *Braiding, *Channel morphology, Stratigraphy, Sedimentary structures, Particle size, Sedimentation, Sediment transport, Bed load, Gravels, Glacial drift, Canada.
Identifiers: Donjek River (Canada).

A straight, four-mile tract of the Donjek River, Yukon Territory, is braided throughout, discharging about 50,000 cu ft per sec in flood. The active part of the tract shows upper-regime flow in the main channels, and lacks vegetation. Higher, older levels are former river courses, partly or completely vegetated, with continuous flow (principally lower regime) only in the main channels. The younger surfaces are more strongly dissected because of active channel cutting, whereas channels on older levels are subject to infilling. The sediments vary from clays to coarse gravels; most are poorly sorted. Three main groups are: silt and mud of low energy environments, such as abandoned channels; gravel of high energy channel-bar complexes; and a variable intermediate group which fills channels under medium-energy conditions. Seven facies are distinguished on textural, floral, and sedimentary structural characteristics. Facies relations are mostly gradational within channels, commonly fining upward. They are more complex between channels, and invariably erosional. The origin and directional significance of hierarchical orders of sedimentary structures were studied. Six hundred and sixty measurements of small-scale structures (mostly ripples) show moderate within-bar and between-bar variation, and give a grand vector mean 22 deg from the river trend. Bisectors of channel directional arcs (maximum and average ranges) approximate the river trend within 5 deg. (See also W73-11790) (Knapp-USGS)
W73-11808

VEGETATION, MICROTOPOGRAPHY, AND DEPTH OF ACTIVE LAYER ON DIFFERENT EXPOSURES IN SUBARCTIC ALPINE TUNDRA,
Portland State Univ., Oreg. Dept. of Geography.
L. W. Price.
In: Icefield Ranges Research Project Scientific Results, Vol 3, American Geographical Society, New York, NY, and Arctic Institute of North America, Montreal, Canada, p 211-220, 1972. 12 fig, 22 ref.

Descriptors: *Tundra, *Vegetation, *Solifluction, *Permafrost, Geomorphology, Canada, Vegetation effects, Topography, Arctic, Alpine.
Identifiers: Ruby Range (Canada).

Tundras on four slopes with different exposures (southeast-, southwest-, east-, and north-facing), but with similar gradients, elevations, and rock type, were studied in the Ruby Range, Yukon Territory. Vegetation was best developed on the southeast-facing slope, was successively less on east- and southwest-facing slopes, and least on the north-facing slope. Solifluction lobes were present in varying degrees, and their development largely followed that of vegetation in that they were best developed on the southeast-facing slope and least well developed on the north- and southwest-facing slopes. The vegetation occurred in sharply delineated communities across the lobes on the southeast-facing slope, and the communities repeated themselves in predictable patterns. The same communities were present on the east-facing slope, but were not as distinct. Plant cover was relatively impoverished on southwest- and north-facing slopes, where there were fewer microhabitats and where soil, moisture, and temperature conditions were not found in favorable combinations. Depth of the active layer largely corresponded to the presence of vegetation and microtopography. The active layer was shallowest and most variable on the southeast-facing slope. Plant cover, in general, was more important than exposure in determining the depth of thaw. (See also W73-11790) (Knapp-USGS)
W73-11809

THE COASTAL CHALLENGE,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02L.
W73-11810

PHOSPHATE IN SEDIMENTS OFF SOUTH--WESTERN AFRICA,
Woods Hole Oceanographic Institution, Mass.
C. P. Summerhayes, G. F. Birch, J. Rogers, and R. V. Dingle.
Nature, Vol 243, No 5409, p 509-511, June 29, 1973. 1 fig, 10 ref.

Descriptors: *Phosphates, *Sedimentation, *Continental shelf, *Africa, Sedimentology, Chemical precipitation.

The unconsolidated sediments of the continental shelf off southwestern Africa are considerably enriched in phosphate compared with the values considered usual for clastic sediments. Phosphorite still appears to be forming on a significant scale in the diatomaceous muds off southwest Africa. The abundance of phosphatic sediment is indirectly due to the upwelling of nutrient-enriched oceanic waters and consequent high biological productivity. Modern phosphorite seems to be forming diagenetically in the fine-grained organic rich sediment typical of this area of upwelling. But it is only forming in very small amounts. The bulk of the phosphate is bound in relict detrital gains of phosphorite. These were derived in the late Tertiary, or during low sea level times in the Pleistocene, by mechanical reworking of diatomaceous muds or by the erosion of previously existing phosphorite. (Knapp-USGS)
W73-11811

THE SIGNIFICANCE OF TIME-DEPENDENT TRANSPORTS IN STORM-GENERATED COASTAL CURRENTS,
Institute for Storm Research, Inc., Houston, Tex.
L. J. Goldman.
Society of Petroleum Engineers Journal, Vol 13, No 3, p 156-162, June 1973. 4 fig, 10 ref, append.

Descriptors: *Ocean currents, *Littoral drift, *Storms, *Currents (Water), Waves (Water), Mathematical models, Winds, Advection.

For the case of a storm over deep ocean, the equations of motion were tested by using time-dependent functions to generate the ocean transport. When the effect of a shoaling bottom near shore is considered, the contribution of the time-dependent transport is negligible, whereas the advective terms become important. Considering a storm with a constant speed in a specified direction, the continuity equation was derived for the generation of currents. For a stationary system, equations are not consistent for a steady-state solution except for special cases. For the current in the longshore direction, the geostrophic transport is balanced by stress, and the first term in the relation with the steady-state assumption, defined as the curl of the stress, is equal to the divergence of the flux. Nothing is to be gained by having a time-dependent transport that moves with a storm as a contributing term to coastal currents and storm tide. Wind building of transport at the shore is so large that there is only an insignificant correction from deep-water transports. (Knapp-USGS)
W73-11816

ROLE OF NATURAL AND ANTHROPOGENIC FACTORS IN MUDFLOW FORMATION IN THE UKRAINIAN CARPATHIANS (O ROLI PRIRODNYKH I ANTROPOGENNYKH FAKTOROV V SELEOBRAZOVANII V UKRAINSKIKH KARPATAKH),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
M. M. Ayzenberg.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 84-94, Moscow, 1972. 1 tab, 29 ref.

Descriptors: *Mudflows, *Mountains, Avalanches, Snow, Landslides, Talus, Weathering, Erosion, Precipitation (Atmospheric), Floods, Meteorology, Geology, Engineering geology, Geomorphology, Hydrogeology, Vegetation, River basins.
Identifiers: *Ukraine, *Carpathians, Geodynamics.

The combination of geodynamic conditions and hydrometeorological factors favors the formation of mudflows in the Ukrainian Carpathians. Mudflows are most widespread in upper reaches of the Prut and Tisza River basins, the Bystritsa Nadvornyanskaya River basin, and on other rivers in the Dniester basin, where erosion, landslides, avalanches, talus, and weathering are the principal physiographic phenomena and processes promoting mudflow formation. Precipitation is the most important climatic (meteorological) factor, and snow avalanches commonly occur with mudflows. To study the role of natural and anthropogenic factors in mudflow formation in the region, serious attention must be given to geological, geomorphological, hydrogeological, and biocenotic conditions; to present geological processes; and to hydrometeorological factors. (See also W73-11825) (Josefson-USGS)
W73-11830

INVESTIGATION OF MUDFLOWS IN THE CHEREMOSH RIVER BASIN IN CONNECTION WITH DESIGN OF THE ROSTOKI RESERVOIR (ISSLEDOVANIYE SELEY V BASSEYNE R. CHEREMOSH V SVYAZI S PROYEKTIROVANIYEM ROSTOKINSKOGO VODOKHRANILISHCHA),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
M. M. Ayzenberg, M. L. Vol'ftsun, Ye. V. Khloyeva, and V. V. Yablonskiy.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy

Gidrometeorologicheskiy Institut Trudy, No 119, p 95n105, Moscow, 1972. 1 fig, 1 tab, 19 ref.

Descriptors: *Mudflows, *Reservoirs, *Reservoir design, *River basins, Erosion, Landslides, Talus, Deposition (Sediments), Sediment transport, Sediment sorting, Precipitation (Atmospheric), Floods, Probability, Equations.
Identifiers: *Cheremosh River, *Rostoki Reservoir, Carpathians.

The proposed area of the Rostoki Reservoir on the Cheremosh River is located in the southeastern region of the Carpathians, where mudflow occurrence is most frequent. Intense erosion and presence of landslides and talus in the area favor extensive sediment deposition in the planned reservoir. The volumes of mudflow deposits for the outstanding flood observed in June 1969 and for floods of 1% probability were obtained from analyses of data of hydrometric and meteorological observations as well as from general patterns of mudflow formation. (See also W73-11825) (Josefson-USGS)
W73-11831

DETERMINATION OF SUSPENDED-SEDIMENT DISCHARGES OF VARIOUS PROBABILITIES ON RIVERS IN THE UKRAINE (K OPREDELENIYU KHARAKTERISTIK STOKA VZVESHENNYKH NANOSOV REK UKRAINY RAZLICHNOY OBESPECHENNOSTI),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
Z. A. Goretskaya.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 106-114, Moscow, 1972. 3 fig, 2 tab, 4 ref.

Descriptors: *Sediment discharge, *Suspended solids, *Rivers, *Probability, Discharge (Water), Flood discharge, Floods, Storm runoff, Equations, Curves.
Identifiers: *Ukraine.

Calculations are made of average long-term sediment discharge for lowland rivers in the Ukraine with a short period of record and of probabilities of various annual sediment discharges for ungaged rivers. To determine average long-term sediment discharge, techniques were developed to extend the periods of record, based on a relation of annual sediment discharge to magnitude and intensity of floods. Assumed average water discharge was used as a basis for determining spring-flood discharges. Whenever storm flood contributed to annual sediment discharge, the sum of spring- and storm-flood discharges was used. Extended periods of record of sediment discharge for Ukrainian rivers were subjected to statistical processing to determine relations of average annual sediment discharge to annual sediment discharge of various probabilities. Regional conversion factors, applicable within physiographically homogeneous regions, are proposed for calculating annual sediment discharge for ungaged rivers. (See also W73-11825) (Josefson-USGS)
W73-11832

THE MEANDERING OF ALLUVIAL RIVERS,
Uppsala Univ. (Sweden). Depth of Physical Geography.
L. Hakanson.
Nordic Hydrology, Vol 4, No 2, p 119-128, 1973. 1 fig, 72 ref.

Descriptors: *Channel morphology, *Erosion, *Meanders, *Alluvial channels, *Sediment transport, Alluvium, Sedimentation, Bed load, Scour, Open channel flow.

The formation of meanders is explained by basic physical principles of flowing turbulent water and its interaction with the river bed. Starting from an initially straight and smooth channel, the most probable site of the first erosional scar will be lateral from the center of the river. This scar will then develop into a cavity, which in turn will affect the streamline situation of the flow. In front of the cavity the streamlines will converge, and behind it they will diverge. The diverging streamlines, together with unaffected or less affected streamlines, will then create a new convergence zone behind the first cavity but on the opposite side of the river's center line. The ultimate and most probable and stable result will be a meander. (Knapp-USGS)
W73-11844

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN DAY COUNTY, SOUTH DAKOTA,
South Dakota State Geological Survey, Vermillion.
For primary bibliographic entry see Field 02F.
W73-11847

EROSION PREVENTION DURING HIGHWAY CONSTRUCTION BY THE USE OF SPRAYED ON CHEMICALS,
Virginia Highway Research Council, Charlottesville.
For primary bibliographic entry see Field 05G.
W73-11855

STREAM-PROFILE ANALYSIS AND STREAM--GRADIENT INDEX,
Geological Survey, Washington, D.C.
J. T. Hack.
Journal of Research, U.S. Geological Survey, Vol 1, No 4, p 421-429, July-August 1973. 8 fig, 11 ref.

Descriptors: *Terrain analysis, *Profiles, *Gradients (Streams), *Geomorphology, Maps, Slopes, Sediment transport, Alluvial channels, Degradation (Stream).
Identifiers: *Stream-gradient index.

The geometry of drainage networks is the basis for a simple method of terrain analysis providing clues to bedrock conditions and other factors that determine topographic forms. On a reach of any stream, a gradient-index value can be obtained which allows meaningful comparisons of channel slope on streams of different sizes. The index reflects stream power or competence and is simply the product of the channel slope at a point and channel length measured along the longest stream above the point where the calculation is made. In an adjusted topography, changes in gradient-index values along a stream correspond to differences in bedrock or introduced load. In any landscape the gradient index of a stream is related to total relief and stream regimen. Thus, climate, tectonic events, and geomorphic history must be considered in using the gradient index. Gradient-index values can be obtained quickly by simple measurements on topographic maps, or they can be obtained by more sophisticated photogrammetric measurements that involve simple computer calculations. (Knapp-USGS)
W73-12064

CURRENT SLOPE-STABILITY STUDIES IN THE SAN FRANCISCO BAY REGION,
Geological Survey, Menlo Park, Calif.
T. H. Nilsen, and E. E. Brabb.
Journal of Research, U.S. Geological Survey, Vol 1, No 4, p 431-437, July-August 1973. 3 fig, 34 ref.

Descriptors: *California, *Slope stability, *Landslides, Geomorphology, Degradation (Slope), Erosion, Mass wasting.
Identifiers: *San Francisco Bay region (Calif).

An extensive program of slope-stability studies is presently underway in the San Francisco Bay region, California. Work to date has resulted in the publication of estimates of landslide damage, an estimated-landslide-abundance map of the region, new slope maps prepared by photomechanical processes, photointerpretive maps of landslide, colluvial, and other surficial deposits, and maps of relative slope stability. Landsliding is a major slope-erosion process in the region. The damage resulting from landsliding is very great, and additional development in the upland parts of the region should not be undertaken without careful evaluation of slope stability. (Knapp-USGS)
W73-12065

NEARSHORE CURRENTS AND THE EQUILIBRIUM CUSPATE SHORELINE,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar.
Available from NTIS, Springfield, Va. 22151 as COM-72 10915 Price $3.00 printed copy; $1.45 microfiche. Technical Report 239 (Reference 72-15), May 1972. 20 p, 5 fig, 1 tab, 12 ref.

Descriptors: *Beaches, *Rip currents, *Beach erosion, *Sands, Shores, Data collections, Waves (Water), Model studies, Equations, Oceanography, Tidal effects.
Identifiers: *Cuspate shoreline, Longshore current.

A laboratory experiment was described by Komar (1971) in which rip currents on a beach produced cusps but then suddenly ceased to flow. It was concluded that with a cuspate shoreline a balance can exist between the longshore forces due to an oblique wave approach, tending to produce a longshore current, and the driving forces of the cell circulation, a nonuniform wave breaker height along the shoreline. The equilibrium condition is examined further. The relationship describing the equilibrium is fully derived and used to generate a series of theoretically possible cuspate shoreline forms. When the equilibrium is not complete there may be 'residual' longshore currents due to the lack of balance between the driving forces. A relationship is derived for the longshore current resulting from a combination of a wave height gradient and an oblique wave approach. The 'residual' longshore current could flow either towards the apex of the cusp or towards the embayments, depending on the balance. This may account for the observation that rip currents are sometimes found at the apex and at other times within the embayments of the cusps. (Woodard-USGS)
W73-12075

GEOTECHNICAL PROPERTIES OF OCEAN SEDIMENTS RECOVERED WITH GIANT PISTON CORER: 1. GULF OF MAINE,
Worcester Polytechnic Inst., Mass. Dept. of Civil Engineering.
A. J. Silva, and C. D. Hollister.
Journal of Geophysical Research, Vol 78, No 18, p 3597-3616, June 20, 1973. 8 fig, 3 tab, 51 ref. N00014-66-C-0241, N00014-72-a-037-001.

Descriptors: *Cores, *Atlantic Ocean, *Bottom sediments, Clays, Physical properties, Shear strength, Mineralogy, Sampling, Sedimentology.
Identifiers: *Gulf of Maine.

A large-diameter (14 cm) long piston corer (20-40 m) was used to obtain relatively undisturbed sediment samples in water depths from 80 to 5500 m with recovery ratios ranging between 0.76 and 0.87. The first recovered core was taken in the Stellwagen basin, western Gulf of Maine, at 81-m water depth using a pipe length of 33.5 m and total core weight of 3500 kg. The 21.74 m of recovered sediment is black, gray to olive green silty illitic clay. Structural disturbance of the sediments was not severe, and no postdepositional compaction occurred. Another core was taken about 3 km east of the first core location, and 19.65 m of sediment

were recovered. An anomalous zone reveals high water content (96%) and high shear strength. A marked abundance of diatoms may explain the high water content, and the highly flocculated nature of the abundant clay minerals accounts for the high shear strength. (Knapp-USGS)
W73-12085

AN INFILTRATION MODEL TESTED WITH MONOLITH MOISTURE MEASUREMENTS,
Agricultural Research Service, Brookings, S. Dak. Soil and Water Conservation Research Div.
C. A. Onstad, T. C. Olson, and L. R. Stone.
Soil Science, Vol 116, No 1, p 13-17, July 1973. 3 fig, 1 tab, 12 ref.

Descriptors: *Infiltration, *Soil water movement, *Equations, Hydraulic conductivity, Wetting, Antecedent precipitation, Porosity, Infiltration rates.
Identifiers: Green and Ampt equation.

The Green Ampt equation was used to model mass infiltration curves obtained from flooding soil monoliths. Eight calculations were made on five monoliths under various antecedent moisture conditions. The input parameters, hydraulic conductivity, pressure head, and fillable porosity were measured for soil layers in the vicinity on the monoliths using simple field techniques. The infiltration into the monoliths was calculated and objectively compared with the measured infiltration. In general, the simulations were acceptable but subject to local variations. In general, the model underestimated infiltration volumes especially at times greater than 100 minutes. Local soil conditions influence the results to a considerable extent. (Knapp-USGS)
W73-12087

THE PREDICTION OF SOIL OCCURRENCE IN CERTAIN DESERT REGIONS OF THE SOUTHWESTERN UNITED STATES,
Soil Conservation Service, University Park, N. Mex.
For primary bibliographic entry see Field 02G.
W73-12256

CHEMICAL VARIATIONS IN SEDIMENTARY FACIES OF AN INNER CONTINENTAL SHELF ENVIRONMENT, NORTHERN GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Geology.
T.T. Tieh, T. E. Pyle, D. H. Eggler, and R. A. Nelson.
Sedimentary Geology, Vol 9, No 2, p 101-115, May 1973. 7 fig, 3 tab, 8 ref.

Descriptors: *Bottom sediments, *Gulf of Mexico, *Continental shelf, *Geochemistry, Trace elements, Distribution patterns, Sedimentation, Sedimentology, Statistical methods, Provenance, Sediment transport, Mineralogy.
Identifiers: Trend surface analysis.

Four major sedimentary provinces of the inner continental shelf off the Louisiana coast may be recognized by textural studies: deltaic, nondeltaic, and relict sediments; and delta-destructional sands. Samples from these provinces were analyzed for Rb, Sr, Ni, Fe, Mn, Ti, and Zr; trend surface analysis was used to discern regional distribution of these elements. Although deltaic and nondeltaic sediments cannot be distinguished by chemical criteria, they are distinct from relict sediments, which are low in Mn, Fe, Ti, Zr, Rb, and Ni, and high in Sr. The delta-destructional sands differ from the other three provinces by their low contents of Mn, Fe, Rb, and Ni, and high Ti, Zr, and Sr. In an energetic environment such as this, processes subsequent to deposition tend to disperse Rb, Fe, Ni, and Mn, as these elements are closely associated with the clays; these processes may give rise to enrichment of Zr due to the high stability and density of the mineral zircon, or the enrichment of Sr by accumulation of organic remains. (Knapp-USGS)
W73-12299

BED FORMS OF THE MEDITERRANEAN UNDERCURRENT OBSERVED WITH SIDE-SCAN SONAR,
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 02L.
W73-12300

INTERSTITIAL WATER COMPOSITION IN BARATARIA BAY (LOUISIANA) SEDIMENT,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 02L.
W73-12302

COARSE-GRAINED SEDIMENTATION ON A BRAIDED OUTWASH FAN, NORTHEAST GULF OF ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-12307

DISPOSITION OF SPOIL ON THE DUMP SITE,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05E.
W73-12318

SEDIMENTS OF THE DREDGING AND DISPOSAL AREAS,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05E.
W73-12319

CHARACTERISTICS OF THE PHYSICAL ENVIRONMENT,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05E.
W73-12320

2K. Chemical Processes

ABUNDANCES OF ISOTOPIC SPECIES OF WATER IN THE ST. ELIAS MOUNTAINS,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 02C.
W73-11802

PHOSPHATE IN SEDIMENTS OFF SOUTH--WESTERN AFRICA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W73-11811

SALTS IN THE SEA,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
E. T. Degens.
Nature, Vol 243, No 5409, p 504-507, June 29, 1973. 1 fig, 3 tab, 25 ref.

Descriptors: *Sea water, *Water chemistry, *Lakes, Provenance, Salinity, Salts, Structural geology, Paleohydrology.

Salty hydrothermal solutions are discharged along rift valleys. Their composition gives insight into the chemical evolution of the sea. Lake Kimu is situated about 100 miles north of Lake Tanganyika at the highest point of the East African rift valley, 1,500 m above sea level. The greatest water depth measures 500 m; reducing conditions prevail below about 50 m. The lake is surrounded by active volcanoes, and is fed by salty hydrothermal springs; stable isotope data indicate that the hydrothermal reservoir is charged by local rainwater. The chemical composition of deep Lake Kivu and Kabuno Bay water roughly mirrors, in kind and proportion, the original salt composition of hydrothermal solutions emanating from active rift zones. Based on this assumption, the type and quantity of salts released to the ocean via hydrothermal channels can be calculated. Two types of hydrothermal water can be recognized. The first is associated with active rift zones, and the second is generated from geosynclinal sediments in the process of mountain building. Both are principally of meteoric origin. Ascending rift water supplies new salts to the ocean, whereas rising geosynclinal water recycles salts derived from ancient sediments. The enrichment of sodium and potassium in the continental crust relative to the oceanic crust is attributable to addition of alkalis to the ocean in the vicinity of rifts, removal of potassium by clays, and release of sodium-rich formation water during granitization. Seawater began as a carbonate solution rich in magnesium. It gradually evolved to sodium chloride dominance. The excess CO_2 was removed by carbonate deposition and inorganic and biological CO_2 reduction. (Knapp-USGS)
W73-11812

TITRATION OF SULPHATE IN MINERAL WATERS AND SEA WATER BY USING THE SOLID-STATE LEAD ELECTRODE,
Rome Univ. (Italy). Istituto di Chimica Analitica.
M. Mascini.
Analyst, Vol 98, No 1166, p 325-328, May 1973. 1 fig, 2 tab, 6 ref.

Descriptors: *Water analysis, *Sulfates, *Electrochemistry, Electrodes, Chemical analysis, Instrumentation, Mineral water, Sea water.
Identifiers: *Lead electrodes, Titration.

A procedure is described for the determination of sulfate in the range 20 to 3,000 ppm in mineral and seawaters by using a lead-selective electrode. Chloride and hydrogen carbonate are separated from the sample by passing it first through a cation-exchange resin in the silver form, and secondly through a cation-exchange resin in the acid form. The solution recovered is titrated with standard lead nitrate solution. (Knapp-USGS)
W73-11818

FIELD STUDIES ON SALT LEACHING IN A HIGHLY SALINE SODIC SOIL,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 02G.
W73-11835

IONIC MIGRATION AND WEATHERING IN FROZEN ANTARCTIC SOILS,
Washington Univ., Seattle.
F. C. Ugolini, and D. M. Anderson.
Soil Science, Vol 115, No 6, p 461-470, June 1973. 3 fig, 3 tab, 34 ref.

Descriptors: *Weathering, *Soil formation, *Tracers, *Permafrost, *Antarctic, Sodium, Chlorides, Salts, Diffusion, Ion transport, Frozen soils, Thawing.

Soils of continental Antarctica are developing in one of the most severe terrestrial climates. The persistently low temperatures and the paucity of liquid water have led to soils that are dry, devoid of organic matter, and generally coarse, with poorly developed horizons. Salts are usually present and desert pavement is found in place of the organic layer. Summer thaw, which always is shallow, seldom results in the appearance of liquid water. A preliminary experiment conducted during

the summer of 1968 indicated that Cl ion moved upward in the dry, cold soils of the Lower Wright Valley, Antarctica, during a period of 25 days. During summer of 1969 NaCl was placed at the top of the ice-cemented permafrost at three sites. Na had a maximum migration distance of 5 cm in 2 years. Because prevailing temperatures at these sites are below 0 deg C most if not all of the year, the migration of ions and solutes within the soil profile must occur by diffusive movement in thin films of unfrozen water that separate the mineral surfaces from ice, and in thin films of adsorbed water in those regions devoid of ice. Although the rate of weathering may be slow, the presence of liquid water films of high ionic strength bathing the mineral grains makes mineral dissolution and alteration inevitable. The major differences between weathering in the Antarctic and the weathering of temperate regions are in the rate of weathering and the redistribution of the products of weathering. In Antarctica, which has very immature soils on moraines of about 7,000 years in age, the rate of weathering is very slow. (Knapp-USGS)
W73-11836

METHANE IN LAKE KIVU: NEW DATA BEARING ON ITS ORIGIN,
Woods Hole Oceanographic Institution, Mass.
W. G. Deuser, E. T. Degens, G. R. Harvey, and M. Rubin.
Science, Vol 181, No 4094, p 51-53, July 6, 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Methane, *Lakes, *Aquatic bacteria, Carbon dioxide, Hydrogen, Methane bacteria, Stable isotopes, Africa, Isotope fractionation.
Identifiers: Lake Kivu (Africa).

Lake Kivu, an African rift lake, contains about 50 cubic kilometers of methane (at standard temperature and pressure) in its deep water. Data resulting from two recent expeditions to the lake and a reevaluation of earlier data suggest that most of the methane was formed by bacteria from abiogenetic carbon dioxide and hydrogen, rather than being of volcanic origin or having formed from decomposing organic matter. (Knapp-USGS)
W73-11837

IN SITU SAMPLER FOR MARINE SEDIMENTARY PORE WATERS: EVIDENCE FOR POTASSIUM DEPLETION AND CALCIUM ENRICHMENT,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-11840

CHEMOSTASIS AND HOMEOSTASIS IN AQUATIC ECOSYSTEMS: PRINCIPLES OF WATER POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. Labs. of Applied Chemistry and Applied Biology.
For primary bibliographic entry see Field 05C.
W73-11935

TIME TO CHEMICAL STEADY-STATES IN LAKES AND OCEANS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
A. Lerman.
In: Nonequilibrium Systems in Natural Water Chemistry, Symposium of the American Chemical Society, Division of Water, Air, and Waste Chemistry, February 24-25, 1970, Houston, Texas, p 30-76. 16 fig, 47 ref.

Descriptors: *Chemical properties, *Water chemistry, *Model studies, Chemical reactions, Equilibrium, Diffusion, Advection, Chemical reactions, Equations.
Identifiers: *Chemical steady-states, Chemical transport mechanisms, Chemical diffusion coefficients.

In general, nonhomogeneous distributions of chemical species are a combination of the environmental geometry, its shape and location of the 'sources' and 'sinks' of the chemical species, mechanisms of transport of matter through the system, and nature and rates of the chemical reactions in which the species enter. To visualize the significance of geometric, physical, and chemical factors, a system consisting of a sediment and a water column above it might be considered. The geometric factors in this case are location of sources of the chemical species--at the sediment-water interface, within the sediment, or distributed throughout the water column--and its sinks, such as removal by a chemical or biochemical reaction occurring throughout the system, removal in outflow, or evaporation. The transport mechanisms include dispersal by diffusional processes, water flow (advection), settling of biological or detrital particles through the water column, and accumulation of sediment on the floor. Models of transient and stationary states are described, including transport of conservative chemical species in two- and three-layer lakes, transport of salt between Dead Sea brine layers, oxygen and radium-226 in the oceanic water column, and reacting and conservative species in sediment. (Jones-Wisconsin)
W73-11936

KINETICS OF THE NONBIOLOGICAL DECOMPOSITION AND RACEMIZATION OF AMINO ACIDS IN NATURAL WATERS,
Harvard Univ., Cambridge, Mass. Hoffman Lab.
J. L. Bada.
In: Nonequilibrium Systems in Natural Water Chemistry, Symposium of the American Chemical Society, Division of Water, Air and Waste Chemistry, February 24-25, 1970, Houston, Texas, p 309-331. 3 fig, 3 tab, 95 ref.

Descriptors: *Amino acids, *Degradation (Decomposition), Oxidation, Dendrochronology, Organic matter.
Identifiers: *Dissolved amino acids, *Racemization, Decarboxylation.

Rates of several nonbiological reactions involving amino acids have been evaluated and used to estimate importance of various reactions in natural waters. Rates of most of these reactions are very slow at neutral pH and OC. The fastest reaction under aerobic conditions is a metal ion catalyzed oxidation. The decomposition kinetics of the various amino acids indicate that if dissolved amino acids are not consumed by organisms, they would remain in natural waters for thousands of years or longer. Since the amino acids in natural waters are of biological origin, they should be largely of the L-configuration. By measuring the ratio of the D to L enantiomers of a particular amino acid, it is possible to estimate age of the amino acids dissolved in natural waters. Sedimentation rates and sediment age can be estimated by the racemization of amino acids in the sedimentary column. Rate of nonbiological decomposition and alteration of dissolved organic matter can be determined by studying the kinetics of reactions involving other dissolved organic constituents, and would be useful in estimating how long organic molecules would persist in aquatic environments if not degraded by organisms. (Jones-Wisconsin)
W73-11938

EFFECT OF CLAY ON THE AVAILABILITY OF DILUTE ORGANIC NUTRIENTS TO STEADY--STATE HETEROTROPHIC POPULATIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W73-11954

EXTENT OF DEVELOPMENT AND HYDROLOGIC CONDITIONS OF THE ALLUVIAL AQUIFER, FOUNTAIN AND JIMMY CAMP VALLEYS, COLORADO, 1972,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W73-12023

SIMULATION OF HYDROLOGIC AND CHEMICAL-QUALITY VARIATIONS IN AN IRRIGATED STREAM-AQUIFER SYSTEM--A PRELIMINARY REPORT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02A.
W73-12024

FLOW AND CHEMICAL CHARACTERISTICS OF THE ST. JOHNS RIVER AT JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02L.
W73-12030

MOVEMENT AND QUALITY OF LONG ISLAND SOUND WATERS, 1971,
State Univ., of New York, Stony Brook. Marine Sciences Research Center.
C. D. Hardy.
Technical Report Series No 17, November 1972. 66 p, 49 fig, 28 ref, 1 append.

Descriptors: *Water quality, *Bays, *New York, Water pollution sources, Data collections, Sampling, Chemical properties, Physical properties, Geology, Inflow, Sewage, Nutrients, Dissolved oxygen, Water temperature, Winds, Currents (Water), Path of pollutants, Water analysis, Analytical techniques, Salinity, Tidal effects.
Identifiers: Lower New York Bay, Upper New York Bay, East River (N Y), Long Island Sound (N Y), Block Island Sound (N Y).

The hydrographic features of lower New York Bay, upper New York Bay, the East River, Long Island Sound, and Block Island Sound are described. Winter- formed bottom water exhibits a seasonal lag in warming in the Central Basin of Long Island Sound. The persistence into summer of this colder and denser bottom layer causes limited mixing. The stagnation of this bottom water is promoted by the seasonal formation of a weak thermocline and the inhibition of exchange with Block Island Sound water by the presence of a submarine ridge. A heavy biological oxygen demand is imposed upon the bottom water by the introduction of oxidizable organicmatter from the New York metropolitan area. The depletion of dissolved oxygen is correlated on an annual basis in accord with the frequency and strength of winds. In summer, prolonged periods of calm intensify the vertical stratification, causing seriously lowered dissolved oxygen concentrations in the bottom layer. Maximum concentrations of nutrients (ammonia, urea, orthophosphate) were in the upper East River, reflecting the fact that 43% of the sewage from the New York City municipal system discharges into the upper East River. A two-layered transport system is proposed by which the net transport of East River water into Long Island Sound may be explained. (Woodard-USGS)
W73-12072

WATER QUALITY SURVEY OF THE POTOMAC ESTUARY EMBAYMENTS AND TRANSECTS.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 05A.
W73-12077

WATER QUALITY OF THE POTOMAC ESTUARY GILBERT SWAMP AND ALLEN'S FRESH AND GUNSTON COVE.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.

1970 Data Report No 30, 1973. 18 p.

Descriptors: *Water analysis, *Water quality, *Chemical analysis, *Estuaries, *Maryland, Tributaries, Potomac River, Channeling, Environmental effects, Sampling, Analytical techniques, Organic compounds, Inorganic compounds, Water chemistry Physical properties, Eutrophication.
Identifiers: *Gilbert Run Watershed (Md), Potomac estuary.

The purpose was to establish ambient water quality in the Gilbert Run watershed, Maryland, prior to channel disturbance resulting from the channelization project conducted by the Federal Soil Conservation Service. A special water quality survey of Gunston Cove was started in the spring of 1970 continuing through September to determine the eutrophic condition of the embayment area. The bi-monthly samples taken of Gilbert Swamp and Allen's Fresh for six months, January-July 1970, were analyzed for nutrients, DO, carbon, chlorophyll a and turbidity. Analyses on monthly Gunston Cove samples included nutrients, DO, BOD, carbon, chlorophyll a, coliform and fecal coliform. Other parameters include water temperature and pH. Analytical methods and results are presented. (Woodard-USGS)
W73-12078

SURVEY RESULTS OF THE CHESAPEAKE BAY INPUT STUDY.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 05A.
W73-12079

MAGNESIUM TO CHLORINITY RATIOS IN SEAWATER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. H. Carpenter, and M. E. Manella.
Journal of Geophysical Research, Vol 78, No 18, p3621-3626, June 20, 1973. 1 fig, 2 tab, 17 ref. USAEC Contract AT (11-1)3292.

Descriptors: *Sea water, *Chlorides, *Magnesium, Water chemistry, Sampling.

No evidence was found that the Mg/Cl ratios for North Atlantic water vary with depth or time by as much as 0.1%. The Mg/Cl ratio for seawater appears to be smaller than previously estimated. Samples collected in the Sargasso Sea were analyzed, and temporal or depth variations of the magnesium-chlorinity ratios were within the analytical uncertainties of 0.05%. The mean value of the ratio was 0.06626, which is discrepant from previous estimates by 1%. (Knapp-USGS)
W73-12086

DETERMINATION OF CHLORIDE IN AQUEOUS SOIL EXTRACTS AND WATER SAMPLES BY MEANS OF A CHLORIDE-SELECTIVE ELECTRODE,
Norges Landbrukshoegskole, Vollebekk. Chemical Research Div.
For primary bibliographic entry see Field 05A.
W73-12088

CHEMICAL CHARACTERISTICS OF UNDERGROUND CHALK WATER IN ESSEX AND SUFFOLK,
Essex River Authority (England).
For primary bibliographic entry see Field 05B.
W73-12180

CHEMICAL VARIATIONS IN SEDIMENTARY FACIES OF AN INNER CONTINENTAL SHELF ENVIRONMENT, NORTHERN GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-12299

ANGULAR DEPENDENCE OF SUBSTITUENT EFFECTS IN RIGID, BICYCLIC SYSTEMS,
Georgia Inst. of Tech., Atlanta. School of Chemistry.
C. L. Liotta, W. F. Fisher, and C. L. Harris.
Chemical Communications, 1971. p 1312-1313, 2 tab, 6 ref. OWRR B-049-GA (1).

Descriptors: *Water chemistry, *Chemical reactions, *Hydrolysis, *Organic compounds, Carbon, Hydrogen, Oxygen, Model studies.
Identifiers: *Alkaline hydrolysis, Octane esters.

The rates of alkaline hydrolysis of the isometric ethyl 5,6-epoxybicyclo (2,2,2)octane-2-carboxylates and ethyl bicyclo (2,2,2)octane-2-carboxylate have been measured, and the results analyzed in terms of the two limiting models for the transmission of nonconjugative substituent effects--the inductive and the field models. In order to evaluate the ability of the inductive and field models in describing the transmission of nonconjugative substituent effects, the isometric ethyl 5,6-epoxybicyclo- (2,2,2)octane-2-carboxylates and ethyl bicyclo- (2,2,2)octane-2-carboxylate have been synthesized and their rates of alkaline hydrolysis measured in 50% (by weight) aqueous ethanol at 25 deg. The second-order rate coefficients are summarized. (Woodard-USGS)
W73-12305

A PEDOCHEMICAL SURVEY: I. LITHIUM,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
N. Wells, and J. S. Whitton.
N Z J Sci, Vol 15, No 1, p 90-106, 1972, Illus.
Identifiers: Fertilizers, *Lithium, *Pedochemical survey, Plants, Rock, *Emission spectrography, Surveys, *New Zealand.

The Li contents of rocks, soils, plants, waters and fertilizers in New Zealand were measured by emission spectrography as part of a survey of many elements by various spectrographic techniques. Data are presented for 66 soil-forming rocks, 27 soil profiles, 72 topsoils, 14 litters, 12 spp of plants including 5 seaweeds, 11 river and irrigation waters and 16 fertilizers. In common soil-forming rocks high amounts of Li occur in mudstones, basaltic tuff, rhyolite and mica schist; low amounts occur in limestones, basalts and ultrabasic rocks. Lithium is retained by clay minerals produced during soil weathering, but it can be lost from topsoils during podzolization. The element is not held by organic matter and consequently it is only a minor component of organic soils and litter layers. Plants with high amounts of Li occur on soils flushed by hydrothermal waters and on saline gley recent soils flushed by sea water. Plants with low amounts of the element occur on soils that are strongly weathered and strongly leached. Li held within the structure of clay minerals, e.g. gibbsite, is not available to plants. Fertilizers have a low content of Li, the organic fertilizers being particularly low in this element. Irrigation waters and most rivers have well below the recognized toxic limit for plant growth, but waters of hydrothermal origin have above this level.--Copyright 1973, Biological Abstracts, Inc.
W73-12331

THE TRANSFORMATION OF NITROGEN AND CARBON IN THE SOIL DURING HUMIFICATION OF STRAW LABELLED WITH N15,
Wyzsza Szkola Rolnicza, Poznan (Poland). Dept. of Plant Physiology.
For primary bibliographic entry see Field 02G.
W73-12342

ISOTOPIC COMPOSTION OF WATERS OF THE BROADLANDS GEOTHERMAL FIELD,
Department of Scientific and Industrial Research, Wairakei (New Zealand). Chemistry Div.
W. Giggenbach.
N Z J Sci. Vol 14, No 4, p 959-970. 1971. Illus.
Identifiers: *Isotopic composition (Water), *New Zealand (Broadlands), Thermal waters, *Geothermal fields.

The deuterium and O-18 concentrations of steam and water samples from drillholes 2, 3, 4, 7, 8, 9, 11, 13, 19 and 20 at Broadlands, New Zealand, together with 6 surface water samples from Lake Taupo, Waikato River, and Kaingarosa Forest streams, were determined. The isotopic data agree with the possibility of the thermal waters being derived from local precipitation. These waters undergo O-18 exchange with rocks of the hot aquifer leading to the formation of a deep water with a chloride concentration of about 1150 ppm. The waters entering the drillholes contain varying amounts of excess steam derived from this water at temperatures around 260C. Dilution by cooler and lower chloride waters, or conductive heat changes appear to be of minor significance in influencing the isotopic and chemical composition, and the enthalpies of the drillhole discharges.--Copyright 1972, Biological Abstracts, Inc.
W73-12349

2L. Estuaries

THE COASTAL CHALLENGE,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Inman, and B. M. Brush.
Science, Vol 181, No 4094, p 20-32, July 6, 1973. 13 fig, 3 tab, 51 ref. NOAA SG 04-3-158-22.

Descriptors: *Coasts, *Beaches, *Beach erosion, *Water pollution, *Conservation, Protection, Erosion control, Coastal engineering, Littoral drift, Littoral, Recreation, Preservation, Sediment transport.
Identifiers: Coastal conservation.

Man's rapidly expanding use of the ocean and his increasing incursion into it commonly involves processes that take place in shallow water. These shallow waters are experiencing the bulk of the impact of waste discharges, thermal and radioactive pollution, dredging, coastal construction, mining, and poaching. Processes in nearshore waters are driven by basic, interrelated forces that are systematic and essentially regular in form. These systematic driving forces lead to the development of coherent processes such as the nearshore circulation cells and the longshore transport of sand. Most of the energy for these processes comes from the sea. It is translated by the stress from winds which blow over the ocean and generate waves. Man's intervention takes three interrelated forms: the impact of numbers of people, all competing for portions of the coastal zone; the pollution and contamination of coastal waters; and the critical modification of the natural balance in the ecology of plants and animals and in the sources of sediments. It is imperative that we develop the means to preserve the beaches and harbors that we now have and that we develop practical techniques for creating new beaches and nearshore structures that are less damaging to the environment. From an environmental standpoint there are three fundamental steps necessary for the good design of coastal structures: identification of the important processes operative in an environment, understanding of their relative importance and their mutual interactions, and the correct analysis of their interaction with the contemplated design. (Knapp-USGS)
W73-11810

A FIELD INVESTIGATION OF ROLLOVER FISH PASS, BOLIVAR PENNINSULA, TEXAS,
Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
For primary bibliographic entry see Field 08B.
W73-11854

THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, NEW SOUTH WALES,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 05B.
W73-11912

GROWTH PER MOULT OF TAGGED LOBSTERS (HOMARUS AMERICANUS) IN BONAVISTA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 08I.
W73-11914

A DYNAMIC MODEL OF THE PHYTOPLANKTON POPULATION IN THE SACRAMENTO--SAN JOAQUIN DELTA,
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Programs.
For primary bibliographic entry see Field 05C.
W73-11937

FLOW AND CHEMICAL CHARACTERISTICS OF THE ST. JOHNS RIVER AT JACKSONVILLE, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. Anderson, and D. A. Goolsby.
Geological Survey open-file report 73008, 1973. 105 p, 33 fig, 2 tab, 14 ref.

Descriptors: *Estuaries, *Florida, *Water balance, Salinity, Saline water intrusion, Evapotranspiration, Streamflow, Tides, Water chemistry.
Identifiers: *St. Johns River (Fla), Jacksonville (Fla).

The St. Johns River at Jacksonville, Florida, 21 miles upstream from the ocean, is part of a tidal estuary that extends to Lake George, 106 miles upstream from the ocean. Rising ocean tides at the mouth of the river force large amounts of water up the river past Jacksonville. Most of this water subsequently flows back past Jacksonville as the ocean tide falls. These tidal flows average 87,000 cubic feet per second at Jacksonville, and peak flows exceeding 150,000 cubic feet per second are common. The average tidal flows are more than seven times as large as the average net or freshwater flow. About a quarter of the freshwater that flows into the estuary from April through September is released to the ocean from October through March. When evapotranspiration from the estuary above Jacksonville exceeds rainfall and freshwater inflow into the estuary, the net loss of water tends to cause the volume and duration of the upstream flows to exceed those of the downstream flows. (Knapp-USGS)
W73-12030

THE GREAT MARSH, LEWES, DELAWARE--THE PHYSIOGRAPHY, CLASSIFICATION AND GEOLOGIC HISTORY OF A COASTAL MARSH,
Delaware Univ. Newark. Coll. of Marine Studies.
G. K. Elliott.
Available from NTIS, Springfield, Va 22151 as AD-756-637 Price $3.00 printed copy; $1.45 microfiche. Technical Report No 19, December 1972. 139 p, 10 fig, 1 tab, 42 ref, 5 append. ONR-GP Contract N00014-69-A0407.

Descriptors: *Marshes, *Tidal marshes, *Delaware, *Geomorphology, *Geologic history, Sediments, Geologic formations, Facies (Sedimentary), Sedimentology, Coasts, Salt marshes.
Identifiers: *Great Marsh (Del).

Subsurface investigation of the Great Marsh along the Delaware Bay Coast northeast of the town of Lewes indicates that the landward edge of the marsh represents the leading edge of the ongoing marine transgression. Associated with the marsh facies in this Holocene wedge are sediments of lagoonal-tidal creek facies and barrier facies. The spatial relation of these facies appears to be a function of the configuration of the transgression surface. Their distribution in time is a function of the rate of relative sea-level rise. Within the marsh facies three subfacies, back barrier, fringing, and broad, can be recognized on the basis of geologic setting and sediment texture. Observation of the major phanerogamic vegetation species, along with the composition of the marsh sediment, indicates that the marshes of lower Delaware are transitional between marshes of the New England type and those of the coastal plain type of the Eastern North American group. However, based on the relatively low organic content of the sediment and the lower growth position of Distichlis spicata relative to that of Spartina patens, these marshes demonstrate a stronger affinity to the coastal plain type. (Woodard-USGS)
W73-12033

CURRENTS IN THE SHORE ZONE OF A NONTIDAL SEA (TECHENIYA BEREGOVOY ZONY BESPRILIVNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02H.
W73-12060

HYDROLOGY OF THE PACIFIC OCEAN (GIDROLOGIYA TIKHOGO OKEANA).
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.

Tikhiy okean, Vol II, Izdatel'stvo 'Nauka', Dobrovol'skiy, A. D., editor, Moscow, 1968. 524 p.

Descriptors: *Hydrology, *Pacific Ocean, *Sea water, *Water properties, Water structure, Water temperature, Salinity, Density stratification, Optical properties, Ocean circulation, Ocean currents, Ocean waves, Tides, Sea level, Sea ice, Mixing, Variability, Seasonal, Equations, Maps.
Identifiers: Geostrophic currents, Nomograms.

Volume II of the eight-volume series on the Pacific Ocean was prepared by the staff of the Department of Physical Oceanography of the USSR Academy of Science's Institute of Oceanology on the basis of research performed in 1958-64. Information is provided on properties of sea water (water structure, temperature, salinity, density, and ice formation), mixing, ocean circulation, seasonal variations of sea level, ocean waves and tides, and optical properties of water. An extensive bibliography of Soviet and foreign literature is supplied. (Josefson-USGS)
W73-12063

MOVEMENT AND QUALITY OF LONG ISLAND SOUND WATERS, 1971,
State Univ., of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 02K.
W73-12072

NEARSHORE CURRENTS AND THE EQUILIBRIUM CUSPATE SHORELINE,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W73-12075

MAGNESIUM TO CHLORINITY RATIOS IN SEAWATER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02K.
W73-12086

DISTRIBUTION OF THE CLADOCERAN PODON POLYPHEMOIDES IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05A.
W73-12152

DISTRIBUTION OF THE SALT MARSH SNAIL (MELAMPUS BIDENTATUS SAY) IN RELATION TO MARSH PLANTS IN THE POROPOTANK RIVER AREA, VIRGINIA,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
J. A. Kerwin.
Chesapeake Sci. Vol 13, No 2, p 150-153. 1972. Illus.
Identifiers: Distichlis-Spicata-M, Distribution, Melampus-Bidentatus, Rivers, Spartina-Alterniflora-M, Spartina-Patens-M, *Virginia (Poroporatank River), *Marsh plants, *Snails (Salt marsh).

The distribution and abundance of M. bidentatus Say was related to the distribution of marsh plants within a Virginia estuary. The animal was found in association with 10 spp. of marsh phanerogams, occurring with 3 plant species more than 50% of the time. These plants were Distichlis spicata, Spartina patens, and the short form of S. alterniflora. Mean densities per square meter were 0.23 within the brackish-water marsh and 7.24 in the saltwater marsh. The snail was not obtained by sampling in fish and slightly brackish-water marsh communities.--Copyright 1972, Biological Abstracts, Inc.
W73-12164

THE VASCULAR FLORA OF ANNE ARUNDEL COUNTY, MARYLAND: AN ANNOTATED CHECKLIST,
Maryland Univ., College Park. Dept. of Botany.
M. T. Stieber.
Castanea. Vol 36, No 4, p 263-312. 1971.
Identifiers: Bays, Chesapeake Bay, Coastal plains, Deciduous woods, Ditches, *Estuaries, Flora, Forests, *Maryland (Anne Arundel Co.), Pastures, Pine-G, Species, *Vascular flora.

Anne Arundel County offers a variety of habitats on the Coastal Plain of Maryland in which plants can flourish and diversify. Its waterway boundaries include the saline Chesapeake Bay on the east and its many estuaries which extend far inland, including the Magothy, South, Severn, Patapsco, and Patuxent rivers. Brackish to freshwater swamps found along these estuaries provide a great deal of floral variety. Moist deciduous woods, as well as some dry sandy pine woods and gradations between the two, open pastures, roadsides and ditches-all enhance the possibilities of a rich flora in the county. This study lists 876 spp. of vascular plants, which represent 117 families. The collections and annotations were made from the spring of 1966 through the summer of 1967. Further additions were made to the preliminary study during the summer of 1970.--Copyright 1972, Biological Abstracts, Inc.
W73-12170

A STUDY OF THE MARINE RESOURCES OF THE WAQUOIT BAY-EEL POND ESTUARY,
Massachusetts Dept. of Natural Resources, Boston.
J. R. Curley, R. P. Lawton, J. M. Hickey, and J. D. Fiske.
Mass Dep Nat Resour Div Mar Fish Monogr Ser. 9 p 1-40. 1971. Illus.

Identifiers: Bluefish, Crabs, Estuaries, Flounder, Marine resources, *Massachusetts, Ponds, Quahog, Trout, *Waquoit Bay-eel estuary, *Fish, *Shellfish.

Studies are presented on the extent and value of the marine resources of the major bays and estuaries in Massachusetts. These include available sportfish such as flounder, bluefish and salter trout; shellfish such as quahogs and clams, and blue claw crabs. Recommendations are made to aid in the management and wise utilization of these resources in the Waquoit Bay-Eel Pond estuary.--Copyright 1972, Biological Abstracts, Inc.
W73-12173

ENVIRONMENTAL LAW--EXPANDING THE DEFINITION OF PUBLIC TRUST USES,
For primary bibliographic entry see Field 06E.
W73-12211

LOUISIANA COASTAL COMMISSION.
For primary bibliographic entry see Field 06E.
W73-12217

THE QUALITY OF COASTAL WATERS: FIRST ANNUAL PROGRESS REPORT,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W73-12295

BED FORMS OF THE MEDITERRANEAN UNDERCURRENT OBSERVED WITH SIDE-SCAN SONAR,
National Inst. of Oceanography, Wormley (England).
N. H. Kenyon, and R. H. Belderson.
Sedimentary Geology, Vol 9, No 2, p 77-99 May 1973. 19 fig, 27 ref.

Descriptors: *Sedimentary structures, *Bed load, *Bottom sediments, Continental shelf, Mud, Sands, Sand waves, Scour, Currents (Water), Sonar, Suspended load.
Identifiers: *Mediterranean Sea, *Gulf of Cadiz.

Details of bed forms beneath the Mediterranean undercurrent in the Gulf of Cadiz are depicted on side-scan sonar views to maximum slant ranges of 1 km, 7 km, and 14 km. A sequence of bed-form zones, largely comparable with that of strongly tidal continental-shelf seas, is found to depths of about 1400 m. This, with decreasing current velocity there are zones of scour hollows, sand ribbons, and sand waves, with related deposits. Beyond the sand-wave zone are smooth mud deposits where the undercurrent is in contact with the floor, and large, muddy sediment waves up to 40 m high where it is intermittently in contact with the bottom. These large, muddy-sediment waves are a bed form not found in the tidal-current environment, and are possibly formed by a combination of fall-out from suspension together with occasional bed movement as the base of the undercurrent fluctuates in depth. Variations in the bedding style in the deposits beneath the mud waves are visible on sub-bottom profiles. A stratigraphic boundary between an acoustically transparent layer, possibly representing pelagic sedimentation, and the overlying bedded sequence may define the age of commencement of the undercurrent. Flow paths, including several downslope trending channels, are influenced by gravity, Coriolis force, and topography. (Knapp-USGS)
W73-12300

THE DISTRIBUTION OF DISSOLVED MERCURY IN THE BRISTOL CHANNEL AND SEVERN ESTUARY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-12301

INTERSTITIAL WATER COMPOSITION IN BARATARIA BAY (LOUISIANA) SEDIMENT,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
C. L. Ho, and J. Lane.
Estuarine and Coastal Marine Science, Vol 1, No 2, p 125-135, April 1973. 7 fig, 3 tab, 13 ref.

Descriptors: *Pore water, *Water chemistry, *Bottom sediments, *Organic matter, *Estuaries, Louisiana, Nutrients, Nitrogen, Phosphorous, Phosphates, Productivity, Connate water, Sampling, Freezing.
Identifiers: *Barataria Bay (La).

In Barataria Bay, Louisiana, the interstitial water of John the Fool Bayou is influenced mainly by freshwater; that of Airplane Lake is influenced mainly by seawater. Sediments in the John the Fool Bayou are rich in organic matter, but those in Airplane Lake contain little organic matter. The temperature at which samples were stored exerted significant influence on the results obtained. Surface sediments stored at 4 deg C or on ice resulted in higher release of NH4 and SiO2 to interstitial water than samples stored immediately on dry ice. This was caused by decomposition of organic constituents. Surface sediments frozen immediately on dry ice resulted in higher release of free amino acids, N, P, and PO4 indicating lysis of living organisms. A one-year study of interstitial waters from surface sediments frozen immediately in the field showed that dissolved SiO2, NH4 and PO4 were higher from August through November than during other months. The yearly averages of these nutrients were many times higher than in the corresponding water columns in both areas. Free interstitial amino acids were higher in Airplane Lake sediments than in those of John the Fool Bayou. (Knapp-USGS)
W73-12302

COARSE-GRAINED SEDIMENTATION ON A BRAIDED OUTWASH FAN, NORTHEAST GULF OF ALASKA,
South Carolina Univ., Columbia. Dept. of Geology.
J. C. Boothroyd.
Available from NTIS, Springfield, Va 22151 as AD-759-068 Price $3.00 printed copy; $1.45 microfiche. Coastal Research Division Technical Report No 6-CRD, December 1972. 127 p, 46 fig, 1 tab, 56 ref. ONR N00014-67-A-0230-0001.

Descriptors: *Sediment transport, *Particle size, *Sedimentary structures, *Glacial drift, Alluvium, Alluvial channels, Gravels, Sands, Alaska, Braiding, Alluvial fans, Sedimentation, Sedimentology.
Identifiers: *Gulf of Alaska.

The Scott Glacier outwash fan, northeastern Gulf of Alaska, exhibits a systematic variation in slope (S), clast size, bar morphology, and sedimentary structures in a downstream direction. Slope decreases from 17.5 m/km to less than 2 m/km while clast size decreases from 30 cm to less than 3 cm in 12.5 km. Clast size may be used as an approximate indicator of regional slope. Sheet bars in the upper fan (S>10 m/km) are characterized by poorly sorted coarse gravel with crude bedding while longitudinal bars of the midfan (S<10 m/km) contain more abundant plane-bedded sand and planar crossbeds formed by bar-slipface migration. The clasts are primarily bladed to elongate in shape, well-imbricated, and display excellent long-axis orientations that are transverse to flow direction. Most bar deposition, especially on the upper fan, occurs during an annual flood, under upper flow regime conditions. High flow velocities (2-4 m/sec) are common even during declining flow. Significant large particle transport occurs during these floods. Deposition in channels, by megaripple migration forming festoon crossbeds, is an important process during falling water stages, especially on the lower midfan. The occurrence of large-scale crossbedding increases downstream. (Knapp-USGS)
W73-12307

SEDIMENT DISTRIBUTION IN SOUTHWESTERN DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
R. N. Strom.
Available from NTIS, Springfield, Va 22151 AD-750-714 Price $3.00 printed copy; $1.495 microfiche. Technical Report No 18, July 1972. 118 p, 35 fig, 56 ref, 4 append. ONR Contract No N0014-69-A0407.

Descriptors: *Sedimentology, *Sediments, *Sediment distribution, *Bays, *Delaware, Data collections, Methodology, Sampling, Bathymetry, Surveys, Correlation analysis, Particle size, Sediment transport, X-ray diffraction, Cores.
Identifiers: *Delaware Bay.

Upward and landward migration of sedimentary environments during the Holocene marine transgression has resulted in complex sediment distribution patterns in southwestern Delaware Bay. Analyses of 'thin-skin' surface samples utilizing CM diagrams (Passega), sediment population analysis (Visher) and bathymetric relationships, indicate major processes contributing to the sedimentary distribution pattern: deposition from suspension in quiet water is occurring in Breakwater Harbor; well sorted sand deposits are being formed by the winnowing action of waves on top of the shoals in the open estuary in the northern portion of the study area; and strong tractive currents appear to be the dominant force controlling grain size distribution on The Shears, large shoal areas near the mouth of the Delaware Bay. Subsurface data indicate that the base of the Holocene transgression is in contact with at least two separate pre-Holocene units. The record of the upward and landward migration of laterally adjacent facies is only partially preserved beneath the sediment in the bay. Erosion of sediments deposited in barrier and back barrier environments occurs in a zone of abrasion in the nearshore region. (Woodard-USGS)
W73-12308

ENVIRONMENTAL GUIDE FOR THE U.S. GULF COAST,
National Climatic Center, Ashville, N.C.
For primary bibliographic entry see Field 06G.
W73-12310

NUMERICAL MODEL STUDIES OF THE ST. LAWRENCE RIVER,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
D. Prandle, and N. Crookshank.
Available from NTIS, Springfield, Va 22151 N73-10382 Price $7.75 copy; $1.45 microfiche. Report MH-109, July 1972. 104 p, 64 fig, 8 ref, 3 append.

Descriptors: *Tidal streams, *St. Lawrence River, *Tidal effects, *Channel morphology, *Model studies, Numerical analysis, Mathematical models, Analytical techniques, Water level fluctuations, Flow rates, Tides, Distance, Boundary processes, Sediment transport, Navigation.
Identifiers: Tidal time.

Tidal propagation in the St. Lawrence River was studied using three numerical models. For simulation of the entire 330-mile tidal reach a one-dimensional numerical model was used. A detailed investigation of a smaller section of the river was made using a two-dimensional model. This model was combined with the one-dimensional model to provide convenient boundary conditions. This technique was used also in studying the circulation of the lower estuary with a two-dimensional model. The simulation by the one-dimensional

model was considered sufficiently accurate for most engineering purposes being limited mainly by the accuracy of the available field data. The simulation by the two-dimensional models was of an equivalent degree of accuracy except in those areas where marked vertical stratification occurred. The models will be used to provide input for other studies such as sediment-transport and dispersion investigations. (Woodard-USGS)
W73-12313

RHODE ISLAND MARINE BIBLIOGRAPHY.
Rhode Island Univ., Kingston. Coastal Resources Center.

Available from NTIS, Springfield, Va 22151 as COM73-10227 Price $3.00 printed copy; $1.45 microfiche. Marine Technical Report No 3, 1972. 192 p, 1 fig.

Descriptors: *Bibliographies, *Coasts, *Oceanography, *Rhode Island, Publications, Documentation, Water quality, Salinity, Estuaries, Sounds, Bays, Islands, Marine biology, Marine animals, Water resources, Aquatic life, Beach erosion, Tides, Coastal engineering, Recreation facilities, Indexing, Information retrieval, Hydrologic data, Computer programs.
Identifiers: *Marine bibliography (R I).

The Rhode Island Marine Bibliography was first published in January 1966 as the Rhode Island Marine Bibliography and Atlas Part I Bibliography--Preliminary Draft. This revised bibliography is the first of a series of tools to be utilized in the development of a comprehensive coastal resources management plan. The geographic area covered is defined by a line from the Connecticut border through Fishers Island and Plum Island to Orient Point, then to Gardiners Island, Montauk Point, Block Island, Nomans Land, Gay Head, Cuttyhunk Island and the Rhode Island-Massachusetts border. All citations in the original bibliography have been checked. An effort has been made to obtain copies of all cited documents and ascertain their relevance to the defined area. These citations have been completed, coded and punched; document numbers have been assigned and filed. Over 700 references are cited. (Woodard-USGS)
W73-12316

DISPOSITION OF SPOIL ON THE DUMP SITE,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05E.
W73-12318

SEDIMENTS OF THE DREDGING AND DISPOSAL AREAS,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05E.
W73-12319

CHARACTERISTICS OF THE PHYSICAL ENVIRONMENT,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 05E.
W73-12320

A FEN ON THE NORTHERN CALIFORNIA COAST,
California Univ., Berkeley. Dept. of Botany.
H. G. Baker.
Madrono. Vol 21, No 6, p 405-416. 1972. Illus.
Identifiers: Acid waters, Alaska, *California (Inglenook Fen), Chemical analyses, Coasts, Conservation, Dunes, Hydrosere, Menyanthes-Trifoliata-Conifer-G, Sand, Shell-rich sand dunes, Soils, Waters, Yuki Indians, *Fens, *Menyanthaceae.

Inglenook Fen is situated on the Mendocino County coast of California, nearly at sea-level. It is produced by the impounding of acid waters draining from regional coniferous forest by shell-rich sand-dunes advancing over an uplifted marine terrace. A hydrosere from open water, through fen proper, to fen-carr, and coniferous forest is described together with chemical analyses of waters and soils. Comparison is made with other coastal fens reaching as far north as Alaska, but Inglenook Fen appears to be the southernmost extant example. Previously-existing fens at Point Reyes and at San Francisco are postulated. Menyanthes trifoliata (Menyanthaceae) has its only known lowland occurrence in California here, possibly representing a persistence from the Pleistocene. Associations with extinct Coast Yuki Indians and ecological uniqueness make it important that this fen be conserved.--Copyright 1972, Biological Abstracts, Inc.
W73-12350

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ORANGE COUNTY WATER DISTRICT'S WATER FACTORY 21,
Orange County Water District, Santa Ana, Calif.
For primary bibliographic entry see Field 05D.
W73-11719

THE ALUMINA-LIME SODA WATER TREATMENT PROCESS,
Midwest Research Inst., Kansas City, Mo.
J. W. Nebgen, E. P. Shea, and S. Y. Chiu.
Available from the National Technical Information Service as PB-218 326, $3.00 in papercopy, $1.45 microfiche. Office of Saline Water, Research and Development Progress Report No 820, January 1973. 68 p. Contract 14-30-2935.

Descriptors: *Desalination process, *Water softening, Brackish water, *Chemical precipitation, Waste water treatment.
Identifiers: *Alumina-Lime-Soda Process, *Chemical Pretreatment.

A new pretreatment process for brackish water desalting has been developed and evaluated in the laboratory. The alumina-lime-soda process involves treating raw saline water with sodium aluminate and lime, separating precipitated solids, and neutralizing the separated effluent with carbon dioxide. The water recovered after the carbon dioxide neutralization is feedwater to a desalting process. The sodium aluminate treatment precipitates a calcium sulfoaluminate. Both hardness cation and sulfate anion are removed simultaneously. Therefore, the feedwater is softened and reduced in total salinity. In addition to hardness and sulfate the sodium aluminate-lime treatment also removes boron, silica, iron and manganese. This process is more efficient in removing hardness than conventional lime-soda ash treatment. (OSW)
W73-11748

FINAL DISPOSAL OF EFFLUENT BRINES FROM INLAND DESALTING PLANTS,
Dow Chemical Co., Freeport Tex.
For primary bibliographic entry see Field 05E.
W73-11749

ICE CRYSTALLIZATION STUDIES IN FREEZE DESALINATORS,
Rocketdyne, Canoga Park, Calif.
G. R. Schneider.
Available from the National Technical Information Service as PB-219 253, $3.00 in paper copy, $1.45 microfiche. Office of Saline Water, Research and Development Progress Report No 838, March 1973. 72 p, 5 tab, 28 fig, 9 ref. 14-30-3000.

Descriptors: *Desalination, *Freezing, *Ice crystallization, Nucleation, *Desalination.
Identifiers: Particle size analyzer, Crystal growth, Secondary nucleation, Supercooling, Crystallizer.

Measurements of the ice particle growth velocity and secondary nucleation rate in well-stirred ice-brine suspensions were obtained using the particle size distribution and an analysis of the brine temperature-time record. Size distribution was determined via an automatic particle size analyzer. Growth velocity was found to be directly proportional to supercooling and to decrease with increasing salt concentration. The results are best fitted by a process controlled by the rate of heat and mass transfer. The secondary nucleation rate was determined as a function of supercooling up to 0.706C, for salt concentrations of 20 and 60 gm NaCl/liter H2O, and at mixing powers ranging from 1.9 to 12.5 cal/liter/min. Data on the effect of a soft silicone-rubber-coated impeller on nucleation rate are also presented. (OSW)
W73-11750

SCALE INHIBITION BY ORGANIC ELECTRODEPOSITION,
Tyco Labs, Inc., Waltham, Mass.
For primary bibliographic entry see Field 08G.
W73-11751

FREEZING PROCESS STUDIES: BUTANE STRIPPING IN SPRAYS AND EVAPORATION OF BUTANE DROPS,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.
Y-S. Cheng, R. Nene, P. A. Rice, and A. J. Barduhn.
Available from the National Technical Information Service as PB-218 561, $3.00 in paper copy;, $1.45 in microfiche. Office of Saline Water, Research and Development Progress Report No 823, November 1972. 20 p, 7 fig, 2 tab, 21 ref. 14-30-2578.

Descriptors: *Desalination, *Crystallization, *Freezing, *Ice, Evaporation.
Identifiers: *Butane, Vacuum stripping, Weber number.

Rates of butane removed from water in a vacuum spray chamber have been measured for different chamber pressures, spray velocities and at two nozzle heights. The number of overall transfer units for a given nozzle height correlates well with the Weber number for all the pressures and flow velocities measured. The number of overall liquid transfer units increases from one and one-half to four as the Weber number increases from 0.02 to 0.4. The data at two different nozzle heights indicate that most of the mass transfer is taking place in the liquid sheet attached to the nozzle orifice and not in the spray itself. A unique apparatus also has been designed and constructed which permits an evaporating butane drop to suspend in a flow stream of water. The external phase (water) turbulence levels surrounding the evaporating drop simulate much more closely the conditions encountered by an evaporating drop in an actual butane freezer, than either the rising drop or suspended drop apparatuses used previously. (OSW)
W73-11752

SEARCH FOR NEW DESALINATION MEMBRANES,
State Univ. of New York, Syracuse. Coll. Environmental Science and Forestry.
S. Mukherjee, and P. Luner.
Available from the National Technical Information Service as PB-218 559, $3.00 in paper copy,

$1.45 in microfiche. Office of Saline Water Research, and Development Progress Report No 826, November 1972. 8 p, 3 tab, 2 fig, 8 ref. 14-01-0001-1263.

Descriptors: *Reverse osmosis, *Desalination, *Membranes.
Identifiers: *Chitin, *Chitosan, *Acetylation, Polymeric properties, Moisture content, Film preparation.

Chitin has been deacetylated to produce chitosan. Chitosan salt film have been cast from dilute acetic acid solvent and free amine films have been generated by an alkali coagulation technique. The water content of these films and coagulated membranes is high, and this makes them unsuitable for being used as desalination membranes. Heat treatment on these films in the temperature range 50-150C did not improve the properties. Chitin and chitosan have been acetylated using a number of procedures. It is concluded that the method using anhydrous hydrogen chloride is the best and leads to a product from which films can be made. Chitosan seems to be N-acetylated to form products similar to chitin. Only poor films were prepared by casting from 99% formic acid at room temperature. (OSW)
W73-11753

THE INFLUENCE OF SURFACES ON THE STRUCTURE OF WATER,
North American Rockwell Corp., Canoga Park, Calif.
For primary bibliographic entry see Field 01B.
W73-11754

DIFFERENTIAL SCANNING CALORIMETRY OF CELLULOSE ACETATE,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
B. Kokta, P. Luner, and R. Suen.
Available from the National Technical Information Service as PB-218 562, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No 829, November 1972. 16 p, 9 fig, 2 tab, 14 ref. 14-01-0001-1263.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Cellulose, *Heats of fusion, *Melting points, Crystallinity.
Identifiers: Differential scanning calorimetry, Asymmetric membranes, Dense films, *Cellulose acetate.

The melting temperatures and heats of fusion have been determined for cellulose acetate (2.5) in the form of a powder, dense film, ultra-thin film, and reverse osmosis membrane. The main melting temperatures were in the range of 230C + 2C although often a secondary peak was located at 217 plus or minus 2C. Powdered samples showed broad melting peaks with low heats of fusion. Higher heats of fusion and sharper peaks were obtained from films prepared by the 'dipping' technique. Varying the sample techniques did not change the values for the heats of fusion. Still higher heats of fusion were obtained when the cellulose acetate (2.5) was cast from acetone. Some increase in the heats of fusion resulted when the latter samples were heat treated at 85C. The heats of fusion of commercial membranes were independent of the reverse osmosis properties. It is suggested that the rejection layer of Loeb-type membranes has the same degree of crystallinity as the porous substrate. (OSW)
W73-11755

MONOMOLECULAR FILM PROPERTIES OF CELLULOSE AND AMYLOSE TRIACETATES AT THE AIR-WATER INTERFACE,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
M. Hittmeier, L. S. Sandell, and P. Luner.
Available from the National Technical Information Service as PB-218 555, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Research and Development Progress Report No 827, November 1972. 18 p, 7 fig, 2 tab, 32 ref.

Descriptors: *Reverse osmosis, *Desalination, Cellulose, *Surface pressure, Compressibility, *Hysteresis.
Identifiers: Amylose diacetate, Pyranose rings, Wilhelmy film balance, Limiting areas, Pressure-area isotherms, *Cellulose triacetate, Langmuir film balance.

Surface pressure-area isotherms of cellulose triacetate and amylose triacetate at the air-water interface were determined on a vertical and horizontal film balance. Both polymers show anomalous behavior on the vertical balance, including: higher compressibilities than obtained on the horizontal balance, movement of the vertical plate, and atypical hysteresis of the isotherms. The behavior of the cellulose triacetate film is attributed to heterogeneous gelation of the monolayer at low pressure. A mechanism involving the lateral tilting of pyranose units at the interface and subsequent stabilization of the monolayer by van der Waal's interactions accounts for the properties of this film. A helical conformation for anylose triacetate at the air-water interface is proposed to explain the low compressibility of this monolayer. (OSW)
W73-11756

IONIC BLOCK COPOLYMERS AS PIEZODIALYSIS MEMBRANES,
Shell Development Co., Emeryville, Calif.
G. Lopatin, H. A. Newey, and O. D. Bergren.
Available from the National Technical Information Service as PB-218 552, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Research and Development Progress Report No 824, January 1973. 42 p, 3 tab, 16 fig, 8 ref. 14-30-2809.

Descriptors: *Desalination, *Membrane processes, *Dialysis, *Permselective membranes, *Ion transport.
Identifiers: *Piezodialysis, Charge mosaic membranes, ABA block copolymers, Anionic membranes, Cationic membranes.

The effects of different process variables on the salt transport and solution flux of charge mosaic membranes with respect to piezodialysis were evaluated. Also the development of techniques to construct fine grained charged mosaic films for use as piezodialysis membranes were carried out. Charge mosaic membranes of a type with a well defined and controlled geometry were used to test the effects of temperature, pressure, concentration, thickness ratio, and anionic exhange capaicty on the salt and solution transport properties of the membranes. Techniques for obtaining proper particle distribution, film casting, film forming, abrasion and testing for leaks were developed. Fine grained charge mosiac membranes with high particle exposure at the membrane surfaces were prepared and tested but no noteworthy piezodialysis activity was observed for these membranes. The work has shown though that composite membranes can be constructed using the special properties of the ionic ABA block copolymers as matrix. (OSW)
W73-11757

DIFFUSION OF SODIUM CHLORIDE IN CELLULOSE AND AMYLOSE ACETATES,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
M. Barnes, C. Skaar, and P. Luner.
Availble from the National Technical Information Service as PB-218 556, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No 825, November 1972. 9 p, 1 tab, 3 fig, 5 ref. 14-01-0001-1263.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, *Diffusion, *Cellulose acetate, Permeability.
Identifiers: Amylose diacetate, Sodium chlroide diffusion, Salt permeability.

A method for measuring the resistance change of a film with time was used to determine the diffusion and apparent permeability coefficients of sodium chlorides in the two polymeric films. The results with cellulose diacetate (CDA, 39.8% acetyl) were comparable to previous results, including reverse osmosis. Amylose diacetate (ADA, 41.2% acetyl) was shown to have a lower diffusion coefficient and apparent permeability to sodium chloride than the CDA films. Heating ADA films greatly reduced the derived coefficients. These results are accounted for on the basis of the ease of crystallization of amylose acetate. (OSW)
W73-11758

WATER DIFFUSION THROUGH CELLULOSE AND AMYLOSE ACETATES,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
M. Barnes, C. Skaar, and P. Luner.
Available from the National Technical Information Service as PB-218 557, $3.00 in paper copy; $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No 831, November 1972. 32 p, 5 tab, 15 fig, 26 ref. 14-01-0001-1263.

Descriptors: *Desalination, *Membranes, Cellulose, *Diffusion, *Crystallization, *Vapor pressure, X-ray diffraction.
Identifiers: *Amylose acetate, Permeability coefficient, Diffusion coefficient, Film thickness, Polymer crystallinity, *Cellulose acetate.

The transport of water through untreated and heated cellulose diacetate membranes and films and through amylose diacetate films was studied at 25C by means of both steady-state and unsteady-state methods. The coefficients obtained by steady-state measurements were confined to the high water vapor activity regions near 0.95 using an inverted cup technique in which one surface of the film was in contact with salt solutions and the opposite surface to air of 0.95 relative vapor pressure. The unsteady state measurements were made in small steps over the range from 0.1 to 0.9 relative vapor pressure for comparison with the steady-state results. The permeability and diffusion coefficients obtained by both techniques increased with increasing film thickness, and the 'true' diffusion coefficients was calculated where possible by correcting for film thickness. The diffusion coefficients obtained by the steady-state method were one or two order of magnitude larger than the unsteady-state coefficients extrapolated to 0.95 relative vapor pressure. The latter coefficients decreased exponentially with increasing mean relative vapor pressure. The steady-state permeability and diffusion coefficients for untreated cellulose diacetates were of the same order of magnitude. Heating reduced the coefficients for the cellulose diacetate films but not those of amylose diacetate. (OSW)
W73-11759

WATER VAPOR SORPTION IN CELLULOSE AND AMYLOSE ACETATES,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
M. Barnes, C. Skaar, and P. Luner.
Available from the National Technical Information Service as PB-218 558, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No 832, November 1972. 25 p, 10 fig, 2 tab, 30 ref. 14-01-0001-1263.

Descriptors: *Reverse osmosis, *Desalination, Cellulose, *Water of hydration, *Sorption.

Identifiers: *Cellulose acetate, *Amylose Acetate, Sorption isotherms, Hailwood-horrobin Theory, Zimm-Lundberg Theory, B.E.T. curves, Clustering Theory.

The experimental water absorption isotherms were discussed in terms of three theories: B.E.T., Hailwood-Horrobin, and Zimm-Lundberg. The Hailwood-Horrobin theory was shown to fit the sorption isotherm throughout most of the relative vapor pressure region while the B.E.T. theory fitted the experimental isotherm up to 0.6 relative vapor pressure. Heating cellulose acetate was shown to have little effect on sorption, but increasing the acetyl content reduced both the hydrated or surface bound water and the water of solution. Amylose acetate sorbed less of both hydrated water and water of solution, and heating reduced the water of solution considerably. This was attributed to a higher degree of ordering, i.e., crystallinity, resulting in a decreased availability of sorption sites and surface area in the amylose polymers. Clustering in all polymers was shown by evaluation of the Zimm-Lundberg cluster function. Heating cellulose acetate or increasing the acetyl contact yielded some initial clustering. Clustering was lower in the amylose acetates. (OSW)
W73-11760

REVERSE OSMOSIS STUDIES OF CELLULOSE AND AMYLOSE ACETATES,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
W. W. Carey, and P. Luner.
Available from the National Technical Information Service as PB-218 563, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water Research and Development Progress Report No 828, November 1972. 18 p, 3 tab, 6 fig, 11 ref. 14-01-0001-1263.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Cellulose, *Salt rejection, Permeability.
Identifiers: Amylose acetate, Salt diffusion, Water vapor permeability, *Cellulose acetate, *Cellulose triacetate.

Short-term reverse osmosis experiments were made on thin films of cellulose diacetate, triacetate, and amylose diacetate. These experimentally determined salt rejection values were compared to those computed from experimental values for D1C1 and D2K determined by water vapor permeability and salt diffusion. The experimental relationship between water and salt permeability is discussed in terms of the effect of changes in these parameters with changes in operating pressure, feed concentration, and required salt rejection. (OSW)
W73-11761

APPARATUS FOR THE SEPARATION OF IONS FROM SOLUTION,
D. D. Ustick.
U.S. Patent No 3,719,583, 4 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 169, March 6, 1973.

Descriptors: *Patents, Sea water, *Desalination, *Demineralization, *Electrolytes, Equipment, Potable water, *Ions, Sodium chloride, Salt water, Separation techniques, Ion transport.
Identifiers: Ion separation, Deionized water.

An ionized solution or electrolyte, such as sea water, is caused to flow through a conduit while passing through a magnetic field produced between magnets of opposite polarity disposed in spaced relationship adjacent opposite wall portions of the conduit. Extending between these magnets are two spaced opposite conduit wall portions of electrically non-conducting porous material, such as porous ceramic material, through the pores of which the positive and negative ions in a solution such as sea water can pass. When subjected to the magnetic field extending between the magnets, the positive and negative ions are deflected laterally away from each other in opposite directions toward the porous walls, and are expelled from the conduit through the pores. The opposite but approximately parallel flow of positive and negative ions through this transverse magnetic field generates an electric current density, a very large percentage of which passes through the faces of the conduit's porous walls. The magnitude of the current density flowing out from the pores of the conduit and into the external medium is a measure of the relative concentration of salt water undergoing desalinization by passing constituent ions (in this case from a salt water solution) through the conduit. If there is no measurable current density at a station downstream along the conduit adjacent the external side of its porous walls, the deionized water leaving the outlet orifice of the conduit is essentially free from salts. (Sinha-OEIS)
W73-11871

MULTI-STAGE FLASH EVAPORATOR FOR DISTILLING BRINES,
Riley-Beaird, Inc., Chicago, Ill. (assignee)
V. W. Kowalski.
U.S. Patent No 3,730,848, 4 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, p 282, May 1, 1973.

Descriptors: *Patents, *Desalination, *Distillation, Brines, Sea water, Salt water, Potable water, *Water treatment, Separation techniques, Equipment, Condensers, *Flash distillation, Evaporators.

This apparatus has two flash stages connected in series and condensing stages situated between them. In this arrangement vapor and distillate flow countercurrent to infeed. The configuration of the evaporator eliminates hot walls which result in the buildup of salt deposits. The elimination of hot areas is achieved by placing the condensing stages between the evaporator stages. This permits further utilization of the infeed to maintain the flash chambers in a temperature condition which while high enough to accomplish flashing is still sufficiently low to prevent salting out and collection of such salt on the walls of the flash stages. (Sinha-OEIS)
W73-11877

WATER PURIFICATION,
Texaco, Inc., New York. (assignee)
For primary bibliographic entry see Field 05F.
W73-11896

BENEFITED WATER DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11988

POLY (N-AMIDO)IMIDES AS SEMIPERMEABLE MEMBRANES,
Office of Saline Water, Washington, D.C.
W. J. Wrasidlo.
Available from NTIS, Springfield, Va 22151 as PB-215 274 Price $3.00 printed copy; $1.45 microfiche. Department of the Interior Patent Application Docket No SAL-1990 (Serial No 316,935), December 20, 1972. 10 p, 2 tab.

Descriptors: *Reverse osmosis, *Semipermeable membranes, *Patents, *Desalination apparatus, Equipment, Water treatment.
Identifiers: Poly (N-amido)imides.

Semipermeable membranes may be prepared from poly (N-amido)imides. Semipermeable membranes consisting essentially of poly (N-amido)imides exhibit superior salt rejection and water flux in reverse osmosis processes. Preparation involves initial reaction of a tetracarboxylic acid dianhydride with an amido-hydrazide to form a polyamic acid, and subsequent dehydration to form the corresponding poly (N-amido)imide. Suitable supports are those conventionally employed in reverse osmosis processes. (Knapp-USGS)
W73-12036

DESALTING IN THE ARID REGIONS,
Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.
R. F. Probstein, and J. M. Alvarez.
Presented at Science and Man in the Americas, AAAS/CONACYT meeting, Mexico City, Deserts and Arid Lands Symposium, June 25-27, 1973. 38 p. 46 ref.

Descriptors: *Desalination processes, *Brackish water, *Reverse osmosis, *Electrodialysis, *Ion exchange, Municipal water, Water costs, Water resources development, South America, Mexico, United States, Southwest U.S., Salinity, Priorities, Hydrologic data, Water supply.

Various desalting processes are outlined, with emphasis on those appropriate for treatment of brackish water. Locations, quantity and quality of brackish water resources in the arid regions of the Americas are detailed, with recommendations for priorities in development for municipal supplies, after certain steps necessary to implementation are taken, such as inventories of brackish water resources, establishment of desalting test stations, and r and d programs in desalination. Desalting methods for brackish water suggested are reverse osmosis, electrodialysis, ion exchange, and ion exchange in combination with either of the first two methods. All offer a relatively high degree of operational simplicity. Reported locations and quality of brackish surface and groundwaters in the arid regions of the U.S., Mexico, and South America are shown by a series of maps. However, much charting of the saline supplies remains to be done, particularly in South America. Nevertheless, considerable quantities of low salinity brackish water are known in the dry and water-short regions of the western hemisphere. The economic prospects of desalting for irrigation do not look favorable, but a much more optimistic picture emerges especially in the U.S., with respect to desalting for municipal supplies and certain industrial and mining needs. Appendices contain detailed information on specific known areas of brackish water resources in the U.S., Mexico, Brazil, Peru, Chile, and Argentina. (Paylore-Arizona)
W73-12244

GEOTHERMAL RESOURCES AS A SOURCE OF WATER SUPPLY,
Bureau of Reclamation, Washington, D.C.
J. J. O'Brien.
Journal of the American Water Works Association, Vol 64, No 11, p 694-700, November 1972. 4 fig, 1 map, 1 illus, 1 photo, 3 tab, 3 ref.

Descriptors: *Geothermal studies, *Water supply, *Desalination, Subsidence, Economic feasibility, Costs, Colorado River, Chemical engineering, Salinity, Powerplants, Water resources development, Water costs, Desalination processes, Water temperature, Hot springs, Brines, Planning, Water utilization, Saline water.
Identifiers: *Geothermal investigations, Geothermal resources, Imperial Valley (Calif).

The quantity and quality of water flowing in the Colorado River is not adequate for the demands being made; therefore, the Colorado River Basin Act of 1968 directed the Secretary of the Interior to explore alternatives for increasing the annual river flow by 2.5 million acre-ft. The Bureau of Reclamation (USBR) and Office of Saline Water (OSW) are involved in determining the engineering

and economic feasibility of obtaining freshwater by desalting geothermal brines underlying the Imperial Valley of California. In the initial investigation, 9 shallow test holes were drilled and indicated a major geothermal resource underlies an area called the Mesa Anomaly. A deeper test-production well with a projected depth of 6,500 ft is being drilled. If further investigative stages are approved, a multipurpose development is envisioned whereby USBR and OSW would develop the water resource and nonfederal interests would develop the power-generation and mineral-recovery efforts. Problems considered include: (1) desalting of the geothermal brines having high temperatures (over 350 deg F) and chemical concentration, (2) reinjecting fluids to replace removed geothermal brines (to avoid surface subsidence), and (3) costs of developing a full size project. (USBR)
W73-12333

3B. Water Yield Improvement

RESEARCH IN THE DEVELOPMENT AND UTILIZATION OF ATMOSPHERIC WATER RESOURCES IN MONTANA,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
R. H. Yaw.
Available from the National Technical Information Service as PB-222 004, $3.00 in paper copy, $1.45 in microfiche. Montana University Water Resources Research Center Research Report No 37, 1973. 9 p, 14 append. OWRR A-062-MONT (1).

Descriptors: *Weather modification, *Meteoric water, *Education, *Cloud physics.
Identifiers: *Cloud seeding, *Public relations, *Meteorological.

In the spring of 1972, researchers at Montana State University recognized that intense activity was in progress in several western states to develop and use weather modification techniques to increase growing season precipitation. In Montana, lack of public knowledge and awareness, in combination with a state law which inhibited cooperative research, was minimizing opportunities for the accumulation of factual knowledge of potential value to residents of the state. This research and information program resulted in (1) a greatly increased awareness of weather modification and the need for research in Montana, (2) changes to the state weather modification law, (3) the availability of $100,000.00 for a cooperative state-federal research program, and (4) awareness in theMontana Congressional Delegation of local interests and desires.
W73-11712

UTILIZATION OF GROUND WATER RESOURCES.
For primary bibliographic entry see Field 06E.
W73-11971

WATER QUALITY COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11991

JACKSON-BIENVILLE PARISHES DUGDEMONA WATERSHED DISTRICT.
For primary bibliographic entry see Field 06E.
W73-11995

GREATER BATON ROUGE WATER CONSERVATION DISTRICT.
For primary bibliographic entry see Field 06E.
W73-11996

WATER-BUDGET STUDIES OF LOWER MESILLA VALLEY AND EL PASO VALLEY, EL PASO COUNTY, TEXAS.,
Geological Survey, El Paso, Tex.
For primary bibliographic entry see Field 02A.
W73-12022

3C. Use of Water of Impaired Quality

WATER REUSE, A BIBLIOGRAPHY, VOLUME 1.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11701

WATER REUSE, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11702

3D. Conservation in Domestic and Municipal Use

CURRENT WATER USE REQUIREMENTS IN THE QU'APPELLE RIVER BASIN,
Saskatchewan Water Resources Commission, Regina. Investigation and Planning Branch.
For primary bibliographic entry see Field 06D.
W73-12232

REPORT ON WATER SUPPLY STUDY OF CERTAIN URBAN COMMUNITIES IN THE QU'APPELLE RIVER BASIN.
Saskatchewan Water Resources Commission, Regina. Water Rights Branch.
For primary bibliographic entry see Field 06D.
W73-12233

CONSENSUS: THE FIRST STEP,
Northeastern Illinois Planning Commission, Chicago.
For primary bibliographic entry see Field 06F.
W73-12234

A PROPOSAL FOR A MODEL RIVER PROJECT CONCERNING 'RIVERFRONT BEAUTIFICATION AND UTILIZATION IN METROPOLITAN AREAS.'
Omaha-Council Bluffs Riverfront Development Committee, Nebr.
For primary bibliographic entry see Field 06B.
W73-12235

3E. Conservation in Industry

CURRENT WATER USE REQUIREMENTS IN THE QU'APPELLE RIVER BASIN,
Saskatchewan Water Resources Commission, Regina. Investigation and Planning Branch.
For primary bibliographic entry see Field 06D.
W73-12232

3F. Conservation in Agriculture

SOIL MOISTURE EXTRACTION AND IRRIGATION DESIGN REQUIREMENTS FOR CORN,
Nebraska Univ., Lincoln.
P. E. Fischbach, and B. R. Somerhalder.
Paper 72-770, 1972 Annual Meeting American Society of Agricultural Engineers, Chicago, Illinois, Dec 1972. 15 p, 2 fig, 5 tab, 7 ref.

Descriptors: *Water requirements, *Corn (Field), *Irrigation design, *Sprinkler irrigation, Soil moisture, Root zone, Moisture content, Soil-water-plant relationships, Irrigation systems, Automatic control, Design criteria, Rainfall, On-site investigations, Consumptive use, Crop production.
Identifiers: Moisture sensors, Silty loams.

With today's automated equipment, irrigation can be a matter of pressing a button to place a system into operation. However, water must be efficiently applied and rainfall effectively utilized to minimize water waste and to produce high crop yields. To determine the amount of water required to produce the highest corn yield, in 1971-72, field studies were conducted at the University of Nebraska Field Laboratory. Irrigation frequencies of 1.5, 3.0, 3.5, and 7 days applying water in the amounts of 0.30, 0.24, 0.15, and 0.10 in./day design criteria equivalent were studied on Sharpsburg silty clay loam soil. Soil moisture was at field capacity to a depth of 5 ft when corn was planted on all treatments. Soil moisture extraction patterns were monitored on corn for each of the different frequencies and amounts of water applied on each treatment. Design criteria for irrigation system capacity were calculated to apply the different amounts of water. Irrigation frequencies studied did not affect corn yields or change soil moisture extraction patterns. Yields averaged 8 bushels/acre greater on treatments where 0.15 in./day design criteria equivalent was applied, regardless of irrigation frequency. (USBR)
W73-11727

DETERMINING IRRIGATION POTENTIAL - A COMPUTER MODEL,
G. L. Nimmer, and G. D. Bubenzer.
Paper 72-726, 1972 Winter Meeting American Society of Agricultural Engineers, Chicago, Illinois, Dec 1972. 15 p, 2 fig, 1 tab, 19 ref.

Descriptors: *Water requirements, *Water distribution (Applied), Computer models, Irrigation, Irrigation efficiency, Irrigation effects, Irrigation programs, Irrigation systems, Soils, Water supply, Crops, Management, Evapotranspiration, Bibliographies, Climate, Wisconsin, Soil properties, Agronomy, Planning, Data storage and retrieval.
Identifiers: *Irrigation requirements.

A computer model was developed to provide irrigators with the irrigation requirements for a crop-soil-management system. In the State of Wisconsin, a complete data bank of irrigation parameters and a method of data retrieval were developed for crops, soils, climate, and water supply. Data bank components discussed are: (1) evapotranspiration rates, (2) crop coefficients, (3) soil characteristics, (4) precipitation, and (5) ground-water supply. Output from the computer program may be divided into 3 sections: (1) input data in both original and coded form, and information from the data storage bank related to input data; (2) results obtained from the water balance, such as weekly values of crop coefficients, evapotranspiration, and total and effective precipitation; and (3) summary of irrigation design parameters used throughout the program. Analysis of preliminary tests indicate general agreement with observed irrigation requirements on sandy soils. Little data are available for comparisons on organic and medium textured soils in Wisconsin; however, results obtained appear to agree with current irrigation preactices on these soils. (USBR)
W73-11734

SIDE ROLL SPRINKLERS,
Miller (Marion) and Associates, Inc., Colorado Springs, Colo.
M. Miller.
Irrigation Age, Vol 7, No 6, p 24-25, 62, 65, January 1973. 3 photo, 1 tab.

Descriptors: *Irrigation, *Sprinkler irrigation, *Irrigation systems, Irrigation operation and maintenance, Irrigation efficiency, Irrigation practices, Surface irrigation, Water distribution (Applied), Aluminum, Farm management, Pipes, Agricultural engineering.

The side roll sprinkler is the first successful attempt to mechanize the conventional hand move system. This system can be used on any size rectangular-shaped farm where low to medium height crops are grown. Development of the system and the present approach to the wheel and coupler attachments are described. In 90% of the systems, the wheels are connected to the middle of a pipe length and a coupler, incorporating a riser and drain, connects the pipe lengths. Components used in the present side roll system are: different sizes of aluminum pipes, couplers, wheels, power movers, self-alining risers, and drains. From the standpoint of water distribution, the most popular system is 1/4 mi long, with a sprinkler every length of pipe. Factors to be considered when purchasing a side roll system and recommended operating procedures are presented. (USBR)
W73-11737

FARMING CIRCLES,
Colorado State Univ., Fort Collins.
D. L. Miles.
Irrigation Age, Vol 7, No 6, p 20-21, 48, 53, 56, January 1973. 1 photo.

Descriptors: *Irrigation, *Sprinkler irrigation, Irrigation operation and maintenance, *Irrigation efficiency, Irrigation practices, Irrigation systems, Surface irrigation, Water distribution (Applied), Agricultural engineering, Farm management, Water requirements, Crop response, Planting management.
Identifiers: Irrigation requirement, Cropping patterns.

Circular farming with elimination of end guns, running wheels on ridges, and smoothing the surfaces are procedures that increase the potential profit of center-pivot irrigation farming. For a typical 132-acre system, the elimination of end guns will reduce the irrigated acreage to 122 acres. However, the uniformity of irrigation will usually result in more total yield than from the 132 acres without having to till, plant, fertilize, irrigate, and harvest the additional 10 acres. Running the wheels on a slight ridge reduces rutting and traction problems as the water will run from the tracks. Recommendations that ridges be built around the field and circular planting be used for a more efficient field operation are presented. Smoothing small land undulations and planting parallel to the wheel tracks to eliminate water trapping will result in a more uniform infiltration. Preirrigation, a very important farming practice, when used to the full depth of the root zone, helps to break up surface crusts at the time of planting, and to condition the soil to accept irrigation water. Operating pressure of 85 to 90 psi is recommended at the pivot for common sprinkler spacings of about 30 ft. High operating pressures produce a more constant application of water which can be absorbed easily by the soil. (USBR)
W73-11738

MANURE SLURRY IRRIGATION SYSTEM RECEIVING LOT RUNOFF,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W73-11767

FOREST SOILS AND THE ASSOCIATED SOIL--PLANT WATER REGIME,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02I.
W73-11933

EFFECT OF PRE-SOWING EXPOSURE OF SEEDS TO GAMMA RADIATION ON THE DROUGHT RESISTANCE BEHAVIOR OF BARLEY PLANTS (HORDEUM VULGARE L.),
Banaras Hindu Univ., Varanasi (India). Lab. of Plant Physiology.
O. K. Garg, B. C. Misra, and B. P. Singh.
Plant Soil. Vol 36, No 1, p 39-45, 1972.
Identifiers: *Barley-M seeds, Behavior, Drought, *Gamma radiation, Growth, Hordeum-vulgare-M, Metabolism, Plants, Seeds, Pre-sowing.

In a pot-culture experiment plants were subjected to wilting treatments at tillering stage and were maintained so for 10 days. Observations on survival capacity, growth behavior and physiological changes were made. Reduction in soil moisture caused a setback in the physiological status of the plants and inhibited crop growth. Exposure to gamma-radiation induced drought tolerance, improved growth and maintained an active metabolism even under wilting conditions.--Copyright 1972, Biological Abstracts, Inc.
W73-11953

AN ACT PROPOSING AN AMENDMENT TO ARTICLE IV, SECTION 93, AS AMENDED, OF THE CONSTITUTION OF ALABAMA RELATIVE TO PROVIDING IRRIGATION AND WATER CONSERVATION IN THE STATE.
For primary bibliographic entry see Field 06E.
W73-11963

FLOOD AND EROSION CONTROL.
For primary bibliographic entry see Field 06E.
W73-11978

SOIL CONSERVATION AND FLOOD CONTROL DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11979

SOIL PHYSICAL CONDITIONS AFFECTING SEEDLING ROOT GROWTH: II. MECHANICAL IMPEDANCE, AERATION AND MOISTURE AVAILABILITY AS INFLUENCED BY GRAIN-SIZE DISTRIBUTION AND MOISTURE CONTENT IN SILICA SANDS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Soil Science.
For primary bibliographic entry see Field 02I.
W73-12163

DEW ON WHEAT,
Wye Coll., Ashford (England).
S. W. Burrage.
Agric Meteorol. Vol 10, No 1/2, p 3-12. 1972. Illus.
Identifiers: Air temperature, *Dew, Gradients, Heat, Leaves, Radiation, Vapor, *Wheat-M.

The spatial distribution of leaves, stems and ears within a crop of winter wheat was determined and related to air movement and radiation. Wet and dry bulb air temperatures and leaf temperatures were measured at 4 heights within the crop. The quantity of dew deposited was determined by absorption on blotting paper and weighing. Although greater quantities of dew condensed in the upper regions of the crop, most plant surfaces experienced dew periods of similar duration. On the 10 occasions measured, these lasted 4-14 hr with quantities of dew deposited ranging from 0.02 to 0.33 mm/night. Vapor pressure gradients indicated that the condensation above 60 cm occurred as dewfall and that below 60 cm as distillation, the former being normally about twice the latter. A surface-wetness recorder at a nearby agrometeorological station gave closely similar readings to the duration of surface wetness in the crop.--Copyright 1972, Biological Abstracts, Inc.
W73-12182

ON THE DETERMINATION OF VERTICAL FLUXES IN FIELD CROP STUDIES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research and Regional Survey.
G. F. Byrne, and C. W. Rose.
Agric Meteorol. Vol 10, No 1/2, p 13-17. 1972. Illus.
Identifiers: Agricultural studies, Carbon dioxide, Crops, *Field crop studies, Fluxes, Heat, Transport theory, Vapor, *Vertical fluxes, Water vapor, *Winds.

The use of 1-dimensional transport theory in the measurement of vertical fluxes of such quantities as heat, water vapor and CO2 in situations of agricultural interest may often be inappropriate because of a non-zero mean vertical wind component. Examples of such situations are described and means of detecting them are suggested.--Copyright 1972, Biological Abstracts, Inc.
W73-12183

US-USSR EXPERTISE EXCHANGE,
For primary bibliographic entry see Field 06E.
W73-12255

EFFECT OF WATER STRESS AND HIGH TEMPERATURE ON NITRATE REDUCTION IN CITRUS LEAVES,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Citriculture.
A. Shaked, A. Bar-Akiva, and K. Mendel.
J Hortic Sci, Vol 47, No 2, p 183-190, 1972, Illus.
Identifiers: *Citrus-D leaves, *Israel, Leaves, *Nitrate reduction, Temperature, Water stress.

Nitrate content tended to be inversely related to nitrate reductase in leaves of mature 'Valencia' orange trees located at Bet Dagan, Israel. Field and greenhouse experiments supported the hypothesis that the observed low nitrate reduction and resulting nitrate accumulation in citrus leaves in the summer could be explained on the basis of the separate and combined effects of water stress and temperature stress on citrus plants.--Copyright 1972, Biological Abstracts, Inc.
W73-12330

WIND DISSEMINATION OF WATERBORNE ERWINIA AMYLOVORA FROM PYRUS TO PYRACANTHA AND COTONEASTER,
Iowa State Univ., Ames. Dept. of Horticulture.
R. J. Bauske.
Phytopathology, Vol 61, No 6, p 741-742, 1971, Illus.
Identifiers: Blight, Cotoneaster-integerrima-D, Dissemination, *Erwinia-amylovora, *Pathogens, Pyracantha-coccinea-D, Pyrus-communis-D, Simulated, Weather, Winds, *Pear trees, Bacteria.

Field-grown 2-yr-old Pyrus communis 'Bartlett,' Cotoneaster integerrima Medic., Chaenomeles japonica Lindl., and Pyracantha coccinea 'Kasan' were planted in 6-in clay pots with standard potting soil. To determine the dispersal pattern of water from pear foliage, air was blown through pear trees sprayed with a dye made from food coloring and water. An oscillating fan with settings that produced wind speeds of 7 and 14 mph was placed 12 in from the sprayed trees. E. amylovora inoculum was either sprayed on flowers on immature leaf surfaces with an aerosol sprayer or poured over plant surfaces that were then punctured with a dissecting needle. Inoculated plants were incubated for 48 hr under clear plastic bags. Bacteria were disseminated from infected to healthy plants by simulating a rainstorm with an oscillating fan and a suspended hose with a 2-hole fogging nozzle. Air movement of 7 and 14 mph is capable of moving water droplets at least 40 in, the usual distance between nursery rows. The fan-blown dye produced spots on targets 1/64 to 1/4 in. in diameter. At the greater wind speed, droplets

were delivered higher than the source tree. Inoculation of Cotoneaster and Pyracantha by puncturing succulent shoot tips produced infections that progressed only 1/2 in. down the shoots in Cotoneaster, but 3-4 in. in Pyracantha. Similar inoculations in Chaenomeles yielded no visible infections. Although simulated wind and rain moved the fire blight pathogen from infected pear trees to flowers on previously uninfected Cotoneaster and Pyracantha, and the resulting infections did spread downward into the shoots of shrubs, the lack of transmission of fire blight to foliage of Cotoneaster and Pyracantha reduces considerably the chance that this might occur in the nursery; however, infections were occasionally established on wind-damaged foliage of these shrubs when inoculum was sprayed upon them.--Copyright 1972, Biological Abstracts, Inc.
W73-12338

NITROGEN FERTILIZER RESPONSES OF HETEROPOGON CONTORTUS AND A PASPALUM PLICATULUM PASTURE IN RELATION TO RAINFALL IN CENTRAL COASTAL QUEENSLAND,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Cunningham Lab.
L. 'T Mannetje, and N. H. Shaw.
Aust J Exp Agric Anim Husb. Vol 12, No 54, p 28-35. 1972. Illus.
Identifiers: *Australia (Queensland), Chloride, Coastal lands, *Fertilizers, Heteropogon-Contortus-M, *Nitrogen, Paspalum-Plicatulum-M, Pastures, Phosphates, Potassium, Rainfall, Soils, Yield.

An indigenous pasture in which H. contortus, and a sown pasture in which P. plicatulum was dominant were fertilized with standard applications of superphosphate and potassium chloride. During 5 yr the pastures were treated with 0, 56, 112, 168 and 336 kg N ha-1 per year as urea in 3 equal dressings. Both pastures responded similarly in dry matter yield, N recovery and N concentration. The yield responses were linear and had a mean of 23 kg ha-1 year-1 for every kg of applied N; the mean recovery in plant tops was 44% for Heteropogon and 50% for Paspalum; the N concentration of both pastures was increased from about 1% without N to a maximum of 2% with 336 kg N. The response in yield and the N recovery were linearly related to summer rainfall. In the indigenous pasture 336 kg N ha-1 reduced the proportion of H. contortus by more than half and plants died at the 2 highest levels of N. Resulting bare ground was first filled by weeds and later by introduced grasses from adjacent areas. In the Paspalum pasture P. plicatulum was partly replaced by H contortus at low levels of N. Soil N increased, while pH and exchangeable K decreased with increasing amounts of N.--Copyright 1972, Biological Abstracts, Inc.
W73-12341

EFFECTS OF IRRIGATION AND FERTILIZATION ON YIELDS AND CHEMICAL COMPOSITION OF CORN AND ON THE CHANGES IN THE AVAILABLE K CONTENTS OF A CECIL SOIL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
J. A. Lutz, Jr., C. I. Rich, and E. B. Hale.
Commun Soil Sci Plant Anal. Vol 3, No 3, p 231-242. 1972. Illus.
Identifiers: *Cecil soil, Chemical composition, *Corn-M, Crops, *Fertilization, Irrigation, *Potassium, Rye-M, Soil, Yields, Zea-Mays-M.

Corn (Zea mays L.) was grown for 5 consecutive yr on Cecil fine sandy loam. Plant nutrients consisting of 0, 56, 140, 224 and 280 kg N/ha; 0, 15, 37.5, 60 and 75 kg P/ha, and 0, 28, 70, 112 and 140 kg K/ha were applied in a central composite rotatable design in each of the 5 yr. All plant residue was removed each year when the corn was harvested and the plots were seeded without fertilization to rye each year as a cover crop. One-half of the experiment was irrigated when there was a 50% depletion of available soil moisture in the 0- to 45-cm soil depth. The available K content of the 0- and 15-cm soil depth was not significantly affected by irrigation but decreased with cropping at all rates of applied K. Decreases in available K were less pronounced with increased rates of applied K. The available K content of the 90- to 120-cm depth was similar where 0 and 140 kg K/ha were applied. Irrigation, as compared with no irrigation, decreased the level of available K throughout the profile on uncropped and unfertilized plots. Irrigation increased the N content of corn leaves but did not increase the P and K contents. Corn responsed to N during the last 4 yr, to K only in the 5th yr, and there was no response to P fertilization.--Copyright 1972, Biological Abstracts, Inc.
W73-12343

WEATHER FACTORS AFFECTING THE DEVELOPMENT OF MAIZE FROM SOWING TO FLOWERING,
British Meteorological Office, Bracknell (England).
M. N. Hough.
J Agric Sci. Vol 78, No 2, p 325-331. 1972. Illus.
Identifiers: *England, Flowering, *Maize-M, Solar radiation, Sowing, Temperature, Transpiration, *Weather conditions.

The phenological development from sowing to flowering of the early maize hybrid INRA 200 is related to the weather conditions. Plot trial data from Wytham, near Oxford, England, and weather information from that and nearby sites formed the basic data. The mean rate of development per day from sowing to emergence is related by linear correlation analysis to the mean values of soil temperature at 5 cm depth and soil moisture deficit. A range of temperature thresholds for emergence development exist, which depend upon the soil moisture, and which differ from the true physiological threshold. Between emergence and flowering the mean rate of development per day is related by linear correlation analysis to mean air temperture, solar radiation and potential transpiration estimated from weather data. All correlations are significant, but the parameters which combine radiation and temperature are statistically better.--Copyright 1972, Biological Abstracts, Inc.
W73-12346

THE EFFECT OF PLANT POPULATION AND IRRIGATION ON SUGAR BEET,
Reading Univ. (England). Dept. of Agriculture.
P. M. Harris.
J Agric Sci. Vol 78, No 2, p 289-302. 1972. Illus.
Identifiers: Beet-D, Density, *England, Irrigation, Plant popultion, *Sugar beets.

Four experiments are described in which the response of sugar beet to irrigation was measured over a range of approximately 30,000-150,000 plants/ha, and 1 experiment where the effects of plant population and spatial arrangement were studied. The experiments were carried out on a sandy soil in the south-east of England and extended from 1960-1965. The response of sugar beet to irrigation was affected by plant density. It is suggested that some explanation for the modified responses may be provided by considering effects of plant population on the rate at which the soil surface is covered by leaves, and effects on the volume of soil exploited for water.--Copyright 1972, Biological Abstracts, Inc.
W73-12348

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

SYSTEMS ANALYSIS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger, and Y. Su.
Available from the National Technical Information Service as PB-221 984, $3.00 in paper copy, $1.45 in microfiche. Publication UMICH-ENVSA-73-02, May 1973. 12p. OWRR-C-1602 (No 3145) (1). 14-31-0001-3145.

Descriptors: *Great Lakes, *Systems analysis, *Mathematical models, Optimization, Management, Computer programs, Economics, *Water levels, *Flow control.
Identifiers: *Lake level control, Markov chain models.

The feasibility is examined of controlling the levels of the Great Lakes through control of the outflow from each lake to satisfy given objectives. The multi-lake system is described by a periodic Markov chain decision model. Special algorithms and computer programs were developed which will allow the solution of the large scale optimization problems. Results of the application of these models show that better operating rules for the Great Lakes system exist than those presently in use.
W73-11703

DRAINAGE UNDER STATE LAWS (MINNESOTA AND ARKANSAS).
For primary bibliographic entry see Field 06E.
W73-11966

BURNS V. COASTAL PETROLEUM COMPANY (ACTION TO DETERMINE WHETHER BOTTOM OF LAKE WAS INCLUDED WITHIN OIL AND MINERAL LEASE).
For primary bibliographic entry see Field 06E.
W73-11968

WATER RIGHT CHANGES TO IMPLEMENT WATER MANAGEMENT TECHNOLOGY,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 06E.
W73-11969

KANSAS-NEBRASKA BIG BLUE RIVER COMPACT.
For primary bibliographic entry see Field 06E.
W73-11972

SABINE RIVER AUTHORITY.
For primary bibliographic entry see Field 06E.
W73-11975

BOWIE DAM AND LAKE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 08A.
W73-11977

FLOOD AND EROSION CONTROL.
For primary bibliographic entry see Field 06E.
W73-11978

SOIL CONSERVATION AND FLOOD CONTROL DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11979

INTERSTATE DRAINAGE DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11981

FLOOD CONTROL.
For primary bibliographic entry see Field 06E.
W73-11987

PROTECTION FROM FLOODS.
For primary bibliographic entry see Field 06E.
W73-11990

MILLDAMS AND RACES.
For primary bibliographic entry see Field 06E.
W73-11992

BIG CYPRESS PRESERVE, FLORIDA.
For primary bibliographic entry see Field 06E.
W73-11993

DEEP DRAFT HARBOR AND TERMINAL AUTHORITY.
For primary bibliographic entry see Field 06E.
W73-11994

KEHOE LAKE, TYGARTS CREEK, KENTUCKY (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 06E.
W73-11999

A MASTER PLANNING METHODOLOGY FOR URBAN DRAINAGE,
Rice (Leonard) Consulting Water Engineers, Denver, Colo.
H. F. Bishop.
Preprint No. 1887, American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 21 p, 2 fig, 3 ref. Price: $0.50.

Descriptors: *Urban drainage, *Systems analysis, *Regional analysis, *Drainage systems, Regional development, Environmental engineering, Flood control, Drainage, Management, Colorado.
Identifiers: *Denver (Colo), *Project REUSE.

Effective operation and maintenance of the urban environment requires the coordinated management of the various elements that comprise the area. One of the principal elements of the urban systems is water resources management, including urban drainage and flood control. Project REUSE, a joint undertaking of the Denver Regional Council of Governments and the Urban Drainage and Flood Control District, includes an application of systems engineering to the development of an area-wide management program for urban drainage and flood control. The first application of this methodology was in the master plan for Henry's Lake. Five basic steps in the process are: (1) acquire and develop the facts, (2) analyze the present and future runoff expected, (3) identify major drainage concepts and alternatives, (4) develop, adopt, and implement the master plan for major drainage and design and construct the intital system, and (5) operate the system and program, enforcing needed regulations. In the Henry's Lake case, this approach was complicated by annexation of portions of the basin by the City of Denver. Full implementation has not yet taken place, as Denver has not yet approved the master plan developed for the region. (Poertner)
W73-12006

ENGINEERING REPORT ON MASON STREET AND MILBANK AVENUE DRAINAGE AND DRAINAGE SYSTEMS, GREENWICH, CONNECTICUT.
Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa.
For primary bibliographic entry see Field 08A.
W73-12011

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME I: GOALS, OBJECTIVES, AND STANDARDS FOR WATERWORKS, SANITARY SEWERAGE, SOLID WASTE MANAGEMENT, STORM DRAINAGE AND FLOOD PLAIN MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 05D.
W73-12016

FLOOD PLAIN REPORT - CITY OF SOUTHFIELD.
Southfield City Administrator's Office, Mich.

May 1970. 64 p, 1 fig, 4 tab.

Descriptors: *Flood plains, Planning, Urbanization, Land use, Recreation, Environmental effects, Ecology, Michigan.
Identifiers: *Flood plain management, *Southfield (Mich).

The functions and uses of flood plains in an urbanizing area are discussed from several points of view. Basic background information related to flood plain management is presented in sections: (1) a planning-oriented discussion of the land use aspects of flood plain development; (2) an engineering-oriented discussion of the function of part of the flood plain as a floodway; (3) a presentation of federal, state, and local laws related to flood plain control; (4) a discussion and inventory of various ecological aspects of river basin and flood plain systems; (5) a proposed program for park land acquisition and recreation facilities in flood plain areas; and (6) a short discussion of the tax assessment status of flood plains in Michigan. (Elfers-North Carolina)
W73-12045

'DESERT' BECOMES 'DOWNS:' THE IMPACT OF A SCIENTIFIC DISCOVERY,
Adelaide Univ. (Australia). Dept. of Botany.
A. Marshall.
Aust Geogr, Vol 12, No 1, p 23-34, 1972, Illus.
Identifiers: *Australia (Ninety-mile Desert), *Desert ('Downs'), Elements, Land use, Rainfall.

The Ninety Mile Desert lies between Adelaide and Melbourne, Australia. Nearly all this country has a rainfall of more than 17 inches, hardly a desert by Australian standards. The appearance and disappearance of this desert are discussed. Early appraisal of the country; land use in the period before 1950; the pattern of soils and trace deficiency; and post-war land use are considered.--Copyright 1972, Biological Abstracts, Inc.
W73-12047

RED RIVER EMERGENCY BANK PROTECTION, LOUISIANA, ARKANSAS, AND TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-LA-72-5162-F. $3.25 in paper copy, $1.45 in microfiche. June 9, 1972. 107 p, 1 plate.

Descriptors: *Louisiana, *Environmental effects, *Flood control, *Channel improvements, Arkansas, Texas, Flood protection, Levees, Check structures, Civil engineering, Cutoffs, River regulation, Watershed management, Navigation, Recreation facilities, Water management (Applied), River training, Turbidity.
Identifiers: *Environmental Impact Statements, *Red River, Revetments.

Emergency flood control measures are presently required at 16 locations along the Red River between the Mississippi River and the vicinity of Index, Arkansas, 12 of which are in Lousisana and four in Arkansas. Proposed corrective measures include bendway cutoffs and appurtenant structures to maintain the alinement achieved by the cutoffs and closures to preserve the oxbows; revetments for stabilizing the banks to protect levees and existing developments; and the erection of training works and construction of revetment reinforcement to alleviate undermining of existing works during high water. Adverse environmental effects include the utilization of 1080 acres of land, shortening of the Red River, alteration of the natural appearance of the river and land area and a temporary increase in the turbidity of the water. Alternatives were considered in the selection of the types of stabilization of protective locks, the location and limits of coverage, the degree of channel alinement, and methods for construction and maintenance. The project will reduce flood damages, provide improved recreation facilities and enhance navigation on the Red River. (Mockler-Florida)
W73-12196

HORSE RANGE SWAMP WATERSHED PROJECT, ORANGEBURG COUNTY, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Columbia, S.C.
For primary bibliographic entry see Field 04D.
W73-12201

LITTLE RIVER INLET NORTH CAROLINA AND SOUTH CAROLINA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-SC-5324-F. $4.25 in paper copy, $1.45 in microfiche. June 1972. 41 p, 1 map, 1 append.

Descriptors: *South Carolina, *North Carolina, *Environmental effects, *Navigation, *Dredging, Dikes, Jetties, Inlets, Channel improvement, Turbidity, Channels, Recreation facilities, Beaches, Channel morphology, Commercial fishing, Economics.
Identifiers: *Environmental Impact Statements, *Little River Inlet (N.C. and S.C.), Intracoastal waterway.

This navigation project consists of channels, jetties and sand transition dikes at Little River Inlet, North Carolina and South Carolina. The environmental effects consist of improved navigability of inner channel and ocean entrance and enhanced commercial fishing operations. Recreational boating enthusiasts will also benefit from the project. Adverse environmental effects include a temporary increase in turbidity during construction and future maintenance operations. No alternative plans were developed and no action was deemed impractical. Comments were received from concerned agencies. (Smith-Adam)
W73-12202

AQUATIC PLANT CONTROL AND ERADICATION PROGRAM, STATE OF TEXAS (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Galveston, Tex.

Available from National Technical Information Service, U.S. Dept. of Commerce, as EIS-TX-72-5641-F. $7.25 in paper copy, $1.45 in microfiche. July 27, 1972. 87 p, 1 plate.

Descriptors: *Aquatic weed control, *Herbicides, *Dissolved oxygen, *Texas, *Environmental effects, Water hyacinth, Navigable waters, Navigation, Flood control, Recreation, Public health, Agriculture, Drainage, Alligatorweed, Vegetation establishment, Fish conservation, 2-4-D, Toxins.
Identifiers: *Environmental Impact Statements.

This aquatic weed control program would continue the control and progressive eradication of water hyacinth and alligatorweed in the navigable waters of Texas in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, recreation, public health, and other related purposes. The dying vegetation may temporarily deplete the dissolved oxygen and present a noxious condition toxic to fish. The amine salt and butoxyethanol used for control of water hyacinth are extremely toxic to many broadleaf plants; however, close control of methods of application and observance of season of application and atmospheric conditions will be maintained to prevent damage to other plant species. Alternatives considered included alternate methods of spraying, mechanical control, restricting the supply of nutrients to the water, research to discover a biological control for water hyacinth, and no action at all. Some risk is inherent in the use of the herbicide treatments, but it can be minimized by adhering to all necessary precautions. (Mockler-Florida)
W73-12203

UNION DRAINAGE DIST. NO. 1 V. SPECIAL DRAINAGE DIST. (ACTION BY DRAINAGE DISTRICT TO IMPOSE LIABILITY ON ADJOINING DRAINAGE DISTRICTS TO BEAR SHARE OF COST OF CLEAN-OUT WORK ON DITCHES IN THE DISTRICT).
For primary bibliographic entry see Field 06E.
W73-12208

DRAINAGE LAW IN NORTH DAKOTA: AN OVERVIEW,
North Dakota Univ., Grand Forks. School of Law.
For primary bibliographic entry see Field 06E.
W73-12215

REPORT ON WATER SUPPLY STUDY OF CERTAIN URBAN COMMUNITIES IN THE QU'APPELLE RIVER BASIN.
Saskatchewan Water Resources Commission, Regina. Water Rights Branch.
For primary bibliographic entry see Field 06D.
W73-12233

FLOOD PLAIN INFORMATION, LEHIGH RIVER, JORDAN CREEK AND TROUT CREEK, CITY OF ALLENTOWN, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.

Prepared for the Allentown City Planning Commission, September 1971, 25 p, 10 fig, 11 plates, 7 tab.

Descriptors: *Flood forecasting, *Flood plains, Flood data, Urbanization, Planning, Flood stages, Land use, *Pennsylvania.
Identifiers: Allentown (Pennsylvania), *Lehigh River, Flood plain management.

Special emphasis is placed on possible future floods in the Allentown, Pennsylvania area. These floods are illustrated via various tables of data and, most graphically, through the use of photographs indicating possible flood levels in several urban locations and on several maps of the stream reaches within the urbanized areas of Allentown. The flood hazard maps show the urban areas that would be inundated by an intermediate regional flood and a standard project flood. A discussion of the settlement of the valley area and particularly the flood plains, records of past floods, and information on various factors, such as channel obstructions or flood warnings, that may affect the impact of floods are included. Land use planning control in flood plain areas is very important. (Elfers-North Carolina)
W73-12238

FLOOD PLAIN INFORMATION, LITTLE LEHIGH CREEK, CEDAR CREEK, LITTLE CEDAR CREEK, ALLENTOWN, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.

Prepared for the Allentown City Planning Commission, October, 1972. 36 p, 18 fig, 15 plates, 8 tab.

Descriptors: *Flood forecasting, *Flood plains, Flood data, Planning, Flood stages, Urbanization, Land use, *Pennsylvania.
Identifiers: *Flood plain management, *Allentown (Pennsylvania).

Data are presented from the 1972 floods which were the worst in the recorded history of the local streams near Allentown, Pennsylvania. Emphasis is on possible future floods which could be much worse than those recorded. Most of the land adjacent to the streams is presently open or rural, but there are strong pressures building for urbanization. Thus, land use planning and flood plain management programs will be very important. A discussion of the settlement of the valley area, records of past floods, photographs to illustrate the levels future floods could reach, information on various factors such as obstructions and flood warnings that may affect the impact of floods, and numerous flood hazard maps are given. (Elfers-North Carolina)
W73-12239

MOSQUITOES OF ARIZONA,
Arizona Univ., Tucson.
J. L. McDonald, T. P. Sluss, J. D. Land, and C. C. Roan.
Arizona Agricultural Experiment Station, Technical Bulletin 205. June 1973. 21 p. 10 fig., 1 tab., 14 ref.

Descriptors: *Mosquitoes, *Arizona, *Life cycles, *Pest control, *Water holes, Irrigation water, Systematics, Insects, Environmental sanitation.
Identifiers: Encephalitis.

An up-to-date summary is presented of the female mosquitoes of Arizona. Simplified illustrated keys to genera and species, together with brief diagnostic descriptions of species, are included. A table shows distribution by counties, and summaries of known life cycles. Because of the appearance of encephalitis, both WEE and VEE, in the southwest U.S., there is renewed interest in Arizona mosquitoes from a public health point of view. Recent abnormal and unusual rainfall in Arizona may cause explosive increases in the numbers at any time. Although important mainly as pests rather than vectors, the extent of irrigation present near the main centers of population creates a potential for breeding areas that must be recognized as latently hazardous. Horse and cattle watering troughs and pools in both urban and rural areas add to this possibility. Recommendations for control include avoidance, exclusion, and suppression. (Paylore-Arizona)
W73-12243

DROUGHT EFFECTS ON A SEMIDESERT GRASSLAND RANGE,
Agricultural Research Service, Las Cruces, N. Mex. Plant Science Research Div.
For primary bibliographic entry see Field 02I.
W73-12247

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. I.

Available from University of Arizona, Tucson, Dept. of Hydrology and Water Resources, $22.00 for 3 Vols. Proceedings (Vol I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, Dec 11-14, 1972. 449 p. (1972).

Descriptors: *Water resources development, *Planning, *Management, *Decision making, Economics, *Systems engineering, *Stochastic processes, *Simulation analysis, Hydrology, Data collections, Projects, Hydraulics, Time, Techology, Systems analysis, Mathematical models, Analytical techniques, Streamflow forecasting, Computer programs, Probability, Optimization, *Risks.
Identifiers: Data worth.

This symposium focuses upon the role of the decision sciences in evaluating uncertainties inherent in water resource planning, design, investment, and operations. Included is the interface between water resource management/society/nature/man. Decision sciences refers to the overlapping bodies of knowledge encompassed by operations research, systems analysis, mathematical economics, mathematical statistics, decision theory, social sciences and other relevant subjects used in systems engineering. Specifically, scientific and socio-economic worth of data and models is emphasized, including the complementary effects of time, technology and budgetary constraints in reaching decisions and in designing collection networks for hydrologic and water resource data. Considered are uncertainties in regional planning, flood control, water supply, environmental quality management (in relation to water resources), and other relevant areas of water management; externalities in space and time are of prime importance. An objective of the symposium is to clarify the various dimensions of uncertainty, such as the amount of information available on a specific problem, and the sources or causes of the uncertainty of outcomes. The Proceedings is published in three volumes (See W73-12270 thru W73-12294) (Bell-Cornell)
W73-12269

BAYESIAN ESTIMATION AND DESIGN OF EXPERIMENTS FOR GROWTH RATES, WITH APPLICATIONS TO MEASURING WATER QUALITY,
American Cyanamid Co., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W73-12270

ENVIRONMENTAL CONTROL SYSTEMS: TREATMENT OF UNCERTAINTY IN MODELS AND DATA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-12271

EVALUATION OF SEASONAL TIME-SERIES MODELS: APPLICATIONS TO MID-WEST RIVER FLOW DATA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-12272

TECHNOLOGICAL UNCERTAINTY IN THE ECONOMIC EVALUATION OF NEW WATER RESOURCES,
Hawaii Univ., Honolulu. Coll. of Business Administration.
For primary bibliographic entry see Field 06A.
W73-12273

METHODS FOR ASSESSING VARIABILITY, WITH EMPHASIS ON SIMULATION DATA INTERPRETATIONS,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 07C.
W73-12274

EVALUATION OF PREDICTION ERROR PROBABILITIES FROM STOCHASTIC MODELS BY SIMULATION,
Kentucky Univ., Lexington.
C. T. Haan.
In: Proceedings (Vol. *), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 91-103, (1972). 1 fig, 2 tab, 15 ref.

Descriptors: *Water resources, Hydrology, *Simulation analysis, *Probability, *Stochastic processes, *Estimating, *Model studies, Systems analysis, Equations, Runoff, Streamflow, Rainfall, Projects, Design, Reservoirs, Size, Storage capacity, Human population.
Identifiers: Errors, Data worth.

The adequacy of any water resource system designed solely on the basis of historical records can be assessed only in terms of what has happened in the past. Since future hydrologic sequences will not be the same as the historical sequences, the performance of the system should be evaluated in terms of possible future realizations of the hydrologic process. These future realizations can be obtained only using a stochastic model; any type of stochastic model will have parameters that must be estimated in some manner from historical data. Simulation techniques have been used to estimate the probability of errors of various magnitudes from stochastic models and how these error probabilities change as the number of observations used in estimating the parameters of the stochastic model change. A procedure is given whereby a quantitative estimate can be made of the probability that a stochastic model will produce results that are in error by less than (more than) a specified amount. The procedure can also be used to evaluate the worth of additional data in the sense that one can estimate how the probabilities of errors change as more data is used to determine model parameters. (See also W73-12269) (Bell-Cornell)
W73-12275

FLOOD EVALUATION - CAN STOCHASTIC MODELS PROVIDE AN ANSWER,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-12276

ANALYSIS OF STREAMFLOW FORECASTING UNCERTAINTY,
California State Univ., Sacramento.
M. R. Packer.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, p 115-121, (1972) 2 fig.

Descriptors: Hydrology, *Streamflow forecasting, *Temperature, *River basins, Snowmelt, *Runoff, Floods, Weather forecasting, Seasonal, Water resources, Optimum development plans, Planning, Management, *California, Risks.
Identifiers: *Error, *San Joaquin Drainage Basin (Calif), Friant Dam (Calif), Daily forecasts.

Streamflow forecasts are vital for the optimum utilization of water resources. Forecasts are valuable on controlled rivers (permitting better operation and increased project benefits) as well as on uncontrolled rivers (reducing flood damage by flood warnings). Errors involved in actual streamflow forecasting of a basin subject primarily to snowmelt runoff have been investigated. The sensitivity of streamflow forecasts to meteorological forecast errors has also been examined. The San Joaquin River Basin in California, one of the nation's most controlled streams, was chosen as study area; reservoir operation based on river forecasting is extremely important in maximizing the economic requirements of this area. Snowmelt floods for 1967 and 1969 have been analyzed and daily forecasts studied for 1 to 5 days in advance. The study has been concerned with the statistical evaluation of streamflow forecast errors, exhibiting stable average outcomes. It is verified and quantified that streamflow forecast errors for snowmelt floods are related to temperature forecast errors. The relationship is more distinct for daily streamflow forecasts made more than two days into the future. There is an indication of a constant relationship of forecast errors of streamflow and temperature from year to year when the streamflow errors are in terms of the average seasonal daily flow. (See also W73-12269) (Bell-Cornell)
W73-12277

BIAS, ILLUSION, AND DENIAL AS DATA UNCERTAINTIES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-12278

RELIABILITY AND UNCERTAINTY IN PREDICTING TRANSPORT PROCESSES IN NATURAL STREAMS AND RIVERS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C. L. Chiu.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 137-158, (1972). 10 fig, 3 equ, 2 ref.

Descriptors: *Natural streams, Rivers, *Reliability, *Stochastic processes, *Monte Carlo method, *Simulation analysis, Steady flow, Unsteady flow, Flood routing, Mathematical models, Systems analysis, *Risks, *Forecasting.
Identifiers: *Transport processes, Error, Stream geometry.

Geometrical irregularities of a stream cause uncertainty and error in predicted or calculated transport processes in the stream. The level of error tends to vary with the methods of treating the stream cross-sections to be used in a numerical solution of differential equations for the transport processes. Five different methods of treating stream cross-sections are compared, exhibiting different characteristics and effects. In contrast with deterministic methods, Monte Carlo (stochastic) simulation enables evaluating, controlling and reducing the level of the uncertainty and error. Advantages of using a stochastic model are described, including reduction of the requirement of data storage in a computer. Illustrative examples include steady flow studies using Brownian motion and first-order autoregressive models for South Beaverdam Creek (Georgia), and unsteady flows (flood routing) in the same Creek using numerically solved shallow-water equations and two stochastic models and three deterministic models for comparison. Stochastic modeling and simulation has many attractive advantages useful in predicting or studying transport processes in natural streams. (See also W73-12269) (Bell-Cornell)
W73-12279

HYDROLOGIC FORECASTING WITH SEQUENTIAL DETERMINISTIC AND STOCHASTIC STAGES,
Water Resources Board, Reading (England).
D. G. Jamieson, J. C. Wilkinson, and R. P. Ibbitt.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 177-187, (1972). 2 fig, 12 ref.

Descriptors: Hydrology, *Forecasting, *Simulation analysis, *Rainfall-runoff relationships, *Stochastic processes, Hydrographs, Flows, Time series analysis, Mathematical models, Systems analysis.

A hydrologic forecasting procedure with two distinct stages is proposed. The first stage is deterministic and comprises a simple explanatory simulation model for the initial forecast of runoff from rainfall. The second stage is stochastic and involves a time-series model of the discrepancy between the previously forecast hydrograph and the observed flows. Thus the imperfections in the structure of the simple simulation model can be compensated. The residual variance using the composite model is significantly less than that attainable by use of the first stage alone. (See also W73-12269) (Bell-Cornell)
W73-12280

A PLAN FOR THE CONSTRUCTION AND TESTING OF WATER POLLUTION FORECASTING MODELS,
Missouri Univ., Columbia. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05B.
W73-12281

UNCERTAINTIES IN ESTIMATING RUNOFF--PRODUCING RAINFALL FOR THUNDERSTORM RAINFALL-RUNOFF MODELS,
Agricultural Research Service, Tucson, Arizona. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02A.
W73-12282

STREAMFLOW FREQUENCY USING STOCHASTICALLY GENERATED HOURLY RAINFALL,
CH2M/Hill, Bellveue, Wash.
For primary bibliographic entry see Field 02E.
W73-12284

EFFECT OF LENGTH OF RECORDS OF MONTHLY FLOWS ON THE FIRST SERIAL CORRELATION COEFFICIENT,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 02E.
W73-12285

TESTS OF STATIONARITY OF HYDROLOGIC TIME SERIES,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02A.
W73-12286

STOCHASTIC MODELS FOR PRECIPITATION,
Metropolitan State Coll., Denver, Colo. Dept. of Mathematics.
For primary bibliographic entry see Field 02B.
W73-12287

PHYSICAL ASSUMPTIONS AND THEIR CONSEQUENCES ON MODELLING GROUNDWATER MOVEMENT,
For primary bibliographic entry see Field 04B.
W73-12288

STOCHASTIC STREAM TEMPERATURE MODEL,
Bonneville Power Administration, Portland, Oreg.
W. L. Morse.

In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 324-339, 1972. 2 fig, 32 ref.

Descriptors: *Stochastic processes, *Mathematical models, *Streamflow forecasting, *Water temperature, *Columbia River, *Statistical methods, Water Resources, Simulation analysis, Equations, Systems analysis, *Washington.
Identifiers: Priests Rapids forbay (Wash), Stochastic differential equations.

The one-dimensional form of the thermal energy conservation principle as a quasilinear partial differential equation (PDE) has been shown accurate for point temperature forecasts on completely moxed streams; however, the nonrandomness of its solution is contrary to the behavior of Nature. With aid of a new evaporation coefficient gamma this PDE model is calibrated by minimizing mean square temperature error in routing historical flows through 123 km of the Columbia River to estimate a best gamma. Water temperature distributions at Priest Rapids forebay for four representative 6-hour time periods under nearly homogeneous climatic conditions are then obtained by a statistical simulation of gamma. This procedure lends inherent dynamicism to evaporation over open channel flow. By eliminating the longitudinal distance variable in the PDE model, a stochastic differential equation (SDE) is formulated with random forcing functions obtained from the meteorologic and forebay depth analyses. Initial conditions are the time-averaged components of the in situ water temperature vector, only one of which is needed to determine the real stochastic process which constitues a solution to the SDE model. Validation of the SDE model is accomplished by statistically testing the temporal means, variances, and distributions of the stochastic process solution with those obtained by the statistical simulation of temperatures from the PDE model and historical record. (See also W73-12269) (Bell-Cornell)
W73-12289

UNCERTAINTIES IN POINT AND AREAL SAMPLING OF PRECIPITATION AND THEIR IMPORTANCE IN HYDROLOGIC COMPUTATIONS,
Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development.
For primary bibliographic entry see Field 02B.
W73-12290

VARIABILITY OF THE SOIL WATER FLOW PARAMETERS AND THEIR EFFECT ON THE COMPUTATION OF RAINFALL EXCESS AND RUNOFF,
Agricultural Research Service, University Park, Pa. Northwest Watershed Research Center.
For primary bibliographic entry see Field 02G.
W73-12291

THE DESIGN OF OPTIMAL PRECIPITATION MEASURING NETWORKS FOR FLOOD FORECASTING,
Enviro-Engineers Ltd., Cincinnati, Ohio.
For primary bibliographic entry see Field 02B.
W73-12292

INFORMATION TRANSFER VIA REGRESSION IN MARKOVIAN WORLDS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 06A.
W73-12294

WATER FOR ALABAMA--IDENTIFICATION OF OBJECTIVES,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W73-12315

4B. Groundwater Management

DRAINAGE UNDER STATE LAWS (MINNESOTA AND ARKANSAS).
For primary bibliographic entry see Field 06E.
W73-11966

UTILIZATION OF GROUND WATER RESOURCES.
For primary bibliographic entry see Field 06E.
W73-11971

GREATER BATON ROUGE WATER CONSERVATION DISTRICT.
For primary bibliographic entry see Field 06E.
W73-11996

JUDICIAL-ORIENTED INSTITUTIONAL SOLUTIONS: SAN GABRIEL VALLEY EXPERIENCE,
Clayson, Stark, Rothrock and Mann, Corona, Calif.
D. D. Stark.
Courtesy Preprint, American Society of Civil Engineers, Water Resources Engineering Conference, Washington, D.C., January 29-February 2, 1973. 102 p, 4 fig, 5 tab, 13 ref.

Descriptors: *Groundwater basins, *Safe yield, *Legal aspects, California, Water rights, Pueblo water rights, Competing uses, Regulated flow, Regulation, Water allocation (Policy), Relative rights, Groundwater availability, Water supply.
Identifiers: *Southern California, San Gabriel Basin.

Increased usage of groundwater supplies has resulted in shortages, and these shortages have led to agreements between water users to limit annual water use. Formalization of these agreements through court action has proved to be an effective means of setting up a system to define the rights and responsibilities of all parties involved and to establish a regulatory body. A detailed example of such an arrangement is the San Gabriel Basin Case. Located in eastern Los Angeles County, California, 24 major water users agreed to a sophisticated institutional arrangement for the protection and provision of ground water supplies. Groundwater basin management efforts in Southern California since World War II have involved a sequence of court cases. At times, more than 4000 parties have been involved and cases have continued as long as 23 years. These previous cases helped establish a method for an orderly settlement of the issues in the San Gabriel Basin Case. This case lasted a total of 5 years and involved 200 parties. Available water resources were identified along with water users--both consumptive and non-consumptive users. Limits were placed on the amount of water to be used by each consumptive user. A board of watermasters was established to regulate the system and to import water needed if groundwater levels fell too low. Cost of the imported water is borne in proportion to consumptive use. (Poertner)
W73-12009

GROUNDWATER RECHARGE THROUGH THE ZONE OF AERATION IN A SANDY DESERT (PITANIYE GRUNTOVYKH VOD PESCHANOY PUSTYNI CHERZ ZONU AERATSII),
For primary bibliographic entry see Field 02F.
W73-12061

GROUNDWATER CONSERVATION.
For primary bibliographic entry see Field 06E.
W73-12227

PHYSICAL ASSUMPTIONS AND THEIR CONSEQUENCES ON MODELLING GROUNDWATER MOVEMENT,
H-P. Luhr.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 304-323, 1972. 6 fig, 7 ref.

Descriptors: *Groundwater movement, Flow, Assessments, *Model studies, Hydrology, *Analytical techniques, Design, Wells, Leakage, Dischage (Water), Clogging, Finite element analysis, Reliability, Calibrations, River beds, Infiltration, Aquifers, Surface waters, Equations, Systems analysis, *Risks.
Identifiers: Physical aspects, Morphology.

The consequences for the groundwater flow caused by well discharges or drawdown in excavations for structures, etc., and the general determination of the groundwater flow, respectively, can be studied most usefully by mathematical models. The assessment of groundwater movement near surface waters with partly clogged beds is of particular importance in the design of production wells. The resulting infiltration through beds is considered in a physical model according to the leaky-aquifer-principle. For investigations of large areas of groundwater flow, two-dimensional, horizontal plane and three-dimensional, discrete mathematical models are developed. These models are organized using the method of finite differences and the technique of finite elements. The uncertainties and resulting reliability of the solutions depending on the choice of mathematical models and on the available model parameters are discussed in general and through the use of an example. The uncertainties resulting from the determination of the model parameters and the calibration process as a possibility to reduce these uncertainties are discussed. (See also W73-12269) (Bell-Cornell)
W73-12288

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE JULESBURG REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W73-12296

THE EVALUATION AND APPLICATION OF C--14 DATING OF GROUNDWATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-12297

THE ENVIRONMENTAL IMPACT OF GROUND WATER USE ON CAPE COD--IMPACT STUDY NO. 3,
For primary bibliographic entry see Field 05B.
W73-12303

FEASIBILITY STUDY OF THE EXPLOITATION OF ELECTROMAGNETIC SURFACE WAVE PROPAGATION FOR MINERAL PROSPECTING AND MAPPING THE WATER TABLE,
Nebraska Univ., Lincoln. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 02F.
W73-12311

WATER FOR ALABAMA--IDENTIFICATION OF OBJECTIVES,
Geological Survey of Alabama, University.
For primary bibliographic entry see Field 06B.
W73-12315

GEOTHERMAL RESOURCES AS A SOURCE OF WATER SUPPLY,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 03A.
W73-12333

4C. Effects on Water of Man's Non-Water Activities

EFFECTS OF DEFORESTATION ON WATER QUALITY,
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
G. E. Likens.
In: Symposium on Interdisciplinary Aspects of Watershed Management, August 3-6, 1970, Montana State University, Bozeman, p 133-140. 2 fig, 1 tab, 5 ref.

Descriptors: *Balance of nature, *Forests, *Water quality, Ecosystems, Runoff, New Hampshire, Ions, Sulfates, Bicarbonates, Ammonia, Nitrates, Decomposing organic matter, Nitrification, Temperature, Nutrients, Solar radiation, Eutrophication, Nitrogen cycle, Demonstration watersheds.
Identifiers: *Deforestation, Hubbard Brook (N.H.), White Mountain Natl. Forest (N.H.).

A multidisciplinary study of single, well-defined, watershed-ecosystems was developed in New Hampshire's Hubbard Brook Experimental Forest, where quantitative measurements of the nutrient-hydraulic cycle interactions were made. Results of deforestation on chemical concentrations showed serious malfunctions. Stream runoff increased over that expected had there been no treatment. Stream water became 10 times more acidic, and there were very large increases in concentrations of all major ions except ammonium, sulfate, and bicarbonate. Sulfate and bicarbonate concentrations decreased but ammonium was essentially unchanged relative to undisturbed conditions. An alteration of the basic nitrogen cycle resulted. Total gross export of dissolved substances, exclusive of dissolved organic matter, averaged about 82 metric tons/hectare/year from the deforested watershed and 13 metric tons/hectare/year from an undisturbed watershed during the three years after deforestation. Stream water temperatures after deforestation were some 1 to 5C higher in summer than adjacent streams in undisturbed watersheds. The high nutrient concentrations, increased solar radiation (due to absence of forest canopy) and higher temperature in the stream caused blooms of algae where none had occurred before. (Jones-Wisconsin)
W73-11945

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME IV: AREA WIDE STORM DRAINAGE AND FLOOD PLAIN MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
J. A. Elliott, R. L. Waters, and A. D. Desmarais.
Available from the National Technical Information Service as PB-212 432, $10.75 in paper copy, $01.45 in microfiche. Gulf Regional Planning Commission, Gulfport, Mississippi, 1972. 173 p, 27 fig, 13 tab.

Descriptors: *Comprehensive planning, *Urban drainage, *Flood plains, *Regional analysis, Forecasting, Management, Flood plain zoning, Flood control, Storm runoff, Mississippi, Drainage systems.

The Urban Systems Engineering Demonstration Program of the Gulf Regional Planning Commission has as its general purpose the simultaneous development of systems of waterworks, sanitary sewerage, solid waste management, storm water drainage and flood plain management. This planning commission covers the four counties of Hancock, Harrison, Jackson and Pearl River Counties in Mississippi. This volume is concerned with the development of an inventory and analysis of existing areawide storm drainage systems and preparation of plans to accomodate future needs to 1990. The inventory is based on existing records, plans, and specifications of local, state and federal agencies, while the analysis is based largely upon the adequacy of the drainage facilities to accomodate storm runoff. Recommended improvements are based on the need to reduce flood hazards throughout the region. The Gulf region covers 2608 square miles and has a total population of 268,000 in 1970 of which 74 percent is urban. Eleven cities contain 88 percent of the urban population. The major storm drainage systems in these municipalities are analyzed in detail. Flood plain management is concerned with both the tidal zone and river flood plains. Four steps of action are recommended, namely: (1) flood plain delineation, (2) regulation of land use, (3) construction of flood retarding structures, and (4) a general program of continued studies and surveys of flood plain limits, existing structures, and hydrologic conditions. (Poertner) (See also W73-12016)
W73-12019

HYDROLOGIC CHANGES AFTER CLEAR-CUT LOGGING IN A SMALL OREGON COASTAL WATERSHED,
Geological Survey, Portland, Oreg.
D. D. Harris.
Journal of Research, U.S. Geological Survey, Vol 1, No 4, p 487-491, July-August 1973. 8 fig, 4 tab, 1 ref.

Descriptors: *Clear-cutting, *Rainfall-runoff relationships, Water yield, Erosion, Soil erosion, Sediment yield, Water temperature, Oregon.

Preliminary graphical analysis indicates that clear-cut logging of a small Oregon watershed has significantly altered certain hydrologic characteristics. After logging, moderate increases were noted in annual runoff, but no significant changes were detected in either peak or minimum flow rates. Both the annual sediment yields and the maximum monthly water temperatures increased greatly after logging; sediment yields and temperatures in the unlogged control watershed actually decreased during the postlogging period. (Knapp-USGS)
W73-12066

PROPOSED FLORIDA FRONTIER RIVERS NATIONAL CULTURAL PARK.
For primary bibliographic entry see Field 06E.
W73-12206

4D. Watershed Protection

SABINE RIVER AUTHORITY.
For primary bibliographic entry see Field 06E.
W73-11975

BOWIE DAM AND LAKE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 08A.
W73-11977

LITTLE CALUMET RIVER BASIN COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11983

BIG CYPRESS PRESERVE, FLORIDA.
For primary bibliographic entry see Field 06E.
W73-11993

DEEP DRAFT HARBOR AND TERMINAL AUTHORITY.
For primary bibliographic entry see Field 06E.
W73-11994

JACKSON-BIENVILLE PARISHES DUG-DEMONA WATERSHED DISTRICT.
For primary bibliographic entry see Field 06E.
W73-11995

SOIL CONSERVATION.
For primary bibliographic entry see Field 06E.
W73-12002

DEVELOPMENT OF DWARF GROUND COVER FOR EROSION CONTROL IN COLORADO,
Colorado Div. of Highways, Denver. Planning and Research Div.
H. E. Atchison, and G. C. Pyne.
Available from NTIS, Springfield, Va. 22151 as PB-213 194 - Price $3.00 printed copy; $1.45 microfiche. Final Report CDOH-P and RR-R and SS-72-4, April 1972. 10 p, 2 fig. Contract 1485 FHA.

Descriptors: *Erosion control, *Roadbanks, *Colorado, *Bank stabilization, *Vegetation establishment, Soil stabilization, Arid climates, Mountains, Sediment transport, Sediment control, Investigations, Research and development, Highway beautification, Testing procedures, Grasses, Evaluation.
Identifiers: Dwarf ground-cover vegetation.

Colorado's arid regions and mountainous terrain create the need for a unique ground cover along its highway system to prevent erosion, enhance the beauty of roadside areas, and reduce hazards to the motorist. An investigation is summarized into the possibilities for the development and use of a perennial, dwarf ground cover that would grow at nearly every elevation in Colorado. Such a plant would reseed itself, require no fertilization, and require little or no mowing. Maintenance costs would be reduced to a minimum. (Woodard-USGS)
W73-12071

RED RIVER EMERGENCY BANK PROTECTION, LOUISIANA, ARKANSAS, AND TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 04A.
W73-12196

HORSE RANGE SWAMP WATERSHED PROJECT, ORANGEBURG COUNTY, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Columbia, S.C.

Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-SC-72-5451-F. $4.50 in paper copy, $1.45 in microfiche. October 1972. 49 p, 1 map, 1 tab, 2 append.

Descriptors: *South Carolina, *Flood protection, *Watershed management, *Environmental effects, Agricultural watersheds, Channel improvement, Flood control, Floods, Agriculture, Drainage, Public health, Wildlife habitats, Drainage programs, Erosion control.
Identifiers: *Environmental Impact Statements, *Horse Range Swamp Watershed (S.C.).

Horse Range Swamp Watershed is located in eastern Orangeburg County, South Carolina. The headwaters of the watershed are one mile south of Lake Marion. This project proposes conservation land treatment measures in the watershed and stream channel enlargement for flood prevention and agricultural water management. The project will reduce flooding, improve drainage, provide

opportunities for residents of the watershed to increase their income, improve health conditions, reduce maintenance costs to public roads, destroy a certain amount of wildlife wood habitat, increase suspended sediment at the watershed outlet, and degrade the ambient air quality during construction. Alternatives considered were channel modification at various downstream points, floodwater retarding structures and land treatment measures. The proposed project is compatible with projected future long-term uses of land, water and other natural resources. Some acreage of croplands and mixed hardwoods and pines will be converted to channel, spoil and maintenance travel way. Comments from interested agencies are included. (Reed-Florida)
W73-12201

SOIL CHANGES CAUSED BY EROSION CONTROL TREATMENTS ON A SALT DESERT AREA,
New Brunswick Univ., Fredericton. Dept. of Biology.
For primary bibliographic entry see Field 02G.
W73-12249

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

WASTE-CAUSED AIR POLLUTANTS ARE MEASURED IN SWINE BUILDINGS,
Illinois Univ., Urbana. Agricultural Experiment Station.
D. L. Lebeda, and D. L. Day.
Illinois Research, p 15, Fall, 1965.

Descriptors: Ventilation, *Farm wastes, *Feed lots, Air pollution, *Hogs.
Identifiers: *Tolerance levels, Gas concentrations, Threshold levels.

The practice of collecting swine waste under partially or totally slotted floors has created a need to discover what pollutants are produced and to determine the tolerance levels of the swine to these pollutants. Untreated ponded swine wastes could hypothetically be expected to produce the same gases that untreated municipal waste creates under anaerobic conditions. A study was undertaken to determine the concentrations of ammonia, hydrogen sulfide, carbon dioxide, and airborne bacteria, with and without forced ventilation, in swine buildings with fluid manure. None of the gas concentrations approached the threshold levels for human occupancy, and research is now being planned to determine the tolerance levels of swine. (Dudley-East Central)
W73-11778

TITRATION OF SULPHATE IN MINERAL WATERS AND SEA WATER BY USING THE SOLID-STATE LEAD ELECTRODE,
Rome Univ. (Italy). Istituto di Chimica Analitica.
For primary bibliographic entry see Field 02K.
W73-11818

THE DETERMINATION OF PLUTONIUM-241 IN EFFLUENTS,
Laboratory of the Government Chemist, London (England). Dept. of Trade and Industry.
K. G. Darrall, G. C. M. Hammond, and J. F. C. Tyler.
Analyst, Vol 98, No 1166, p 358-363, May 1973. 2 fig, 6 tab, 19 ref.

Descriptors: *Radioactive wastes, *Radiochemical analysis, Pollutant identification, Nuclear wastes, Radioisotopes.
Identifiers: *Plutonium, Radiochemistry.

A method is described for the simultaneous determination of plutonium-241 and plutonium alpha-activity. The plutonium is isolated by co-precipitation of barium sulfate followed by extraction into di (2-ethylhexyl) phosphoric acid, which is incorporated in a liquid scintallator for counting in a liquid scintillation spectrometer. Interferences from alpha- and beta-emitting radionuclides are studied together with interferences from non-radioactive elements. The lower limit of detection is in the region of 1 pCi. (Knapp-USGS)
W73-11819

OIL SPILLS: MEASUREMENTS OF THEIR DISTRIBUTIONS AND VOLUMES BY MULTIFREQUENCY MICROWAVE RADIOMETRY,
Hulburt (E.O.) Center for Space Research, Washington, D.C.
J. P. Hollinger, and R. A. Mennella.
Science, Vol 181, No 4094, p 54-56, July 6, 1973. 2 fig, 8 ref.

Descriptors: *Microwaves, *Remote sensing, *Oil spills, Path of pollutants, Pollutant identification, Radar.
Identifiers: *Microwave radiometry.

Aircraft-borne multifrequency passive microwave observations of eight marine oil spills revealed that, in all cases, over 90% of the oil was confined in a compact region comprising less than 10% of the area of the visible slick. These measurements show that microwave radiometry offers a means for measuring the distribution of oil in sea-surface slicks; for locating the thick regions; and for measuring their volumes on an all-weather, day or night, and real-time basis. (Knapp-USGS)
W73-11838

STUDIES OF CATION BUDGETS IN THE SOUTHERN APPALACHIANS ON FOUR EXPERIMENTAL WATERSHEDS WITH CONTRASTING VEGETATION,
National Science Foundation, Washington, D.C.
For primary bibliographic entry see Field 02E.
W73-11860

FUNGI OF THE CHESAPEAKE BAY AND ITS TRIBUTARIES II. THE GENUS CONIOSCYPHA,
Maryland Univ., College Park. Dept. of Botany.
C. A. Shearer.
Mycologia, Vol 65, No 1, p 128-136, January-February 1973. 4 fig, 10 ref.

Descriptors: *Marine fungi, *Systematics, Sampling, Rivers, Plant morphology, Cultures, Chesapeake Bay.
Identifiers: *Conioscypha Spp., Patuxent River, Balsa wood, Culture media.

The morphology and condium ontogeny of two species of Conioscypha isolated from balsa wood submerged in the Patuxent River were studied. One species appears to be identical to the type material of Conioscypha lignicola while the second is described as a new species. The description of the genus Conioscypha is emended on the basis of type and pure culture studies of Conioscypha lignicola. (Little-Battelle)
W73-11861

ABUNDANCE AND DIVERSITY OF MOLLUSCA IN AN INDUSTRIALIZED PORTION OF THE OTTAWA RIVER NEAR OTTAWA-HULL, CANADA,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-11862

NESTING BASS OBSERVED WITH UNDERWATER TELEVISION,
Cornell Univ., Ithaca, N.Y.
M. H. Shealy, Jr.
New York's Food and Life Sciences, Vol 4, No 4, p 18-20, Oct - Dec 1971. OWRR A-013-NY (8). 14-01-0001-927, 1400 1852, 14-31-0001-3032.

Descriptors: *Bass, Underwater, *Fish behavior, Aquatic environment, Environmental effects, Methodology.
Identifiers: Underwater television.

Environmental factors governing the survival of Largemouth Bass were studied via underwater television. Concurrent with observing the behavior of the fish, weather, temperature, light and chemical conditions were measured. Through television, laboratory findings can be correlated with natural nesting conditions without disturbing the nest and causing abnormal behavior of the adult bass. (Irwin-New York)
W73-11864

PREPARING TELEOST EMBRYOS FOR STUDY,
Cornell Univ., Ithaca, N.Y.
D. L. Galat.
The Progressive Fish Culturist, Vol 34, No 1, p 43-48, January 1972. OWRR-A-013-NY (9). 14-01-0001-927, 1400, 1852, 14-31-0001-3032.

Descriptors: *Fish eggs, Laboratory tests, Preservation, Methodology.

Documentation of the embryonic development of the muskellunge from preserved eggs was most easily performed when live eggs were fixed and preserved in 10 percent formalin and held no longer than 3 months. Eggs to be cleared were washed in tap water. The chorion was removed by dissection after submersion in a 10 percent bleach solution. The embryos were cleared in glycerine, stained with Harris' hematoxylin, and then stored in 80 percent glycerine. Generally the methods described here will yield preserved fish embryos in which development and environmental effects on development can be observed.
W73-11865

METHOD AND APPARATUS FOR DETERMINING OXYGEN CONSUMPTION RATE IN SEWAGE,
Robertshaw Controls Co., Richmond, Va. (assignee)
For primary bibliographic entry see Field 05D.
W73-11883

ENVIRONMENTAL MONITORING REPORT FOR SANDIA LABORATORIES FROM 1964 THROUGH 1972,
Sandia Labs., Albuquerque, N. Mex.
L. W. Brewer.
Available from NTIS, Springfield, Va., as Rpt. No. SLA-73-0339. $5.45 per copy, $1.45 microfiche. Report No. SLA-73-0339, March 1973. 57 p, 8 fig, 4 tab, 9 ref.

Descriptors: *Monitoring, *Environment, *Measurement, *Water pollution, *Radioactivity, *Soil contamination, *Vegetation, Regulation, Administrative agencies, Sampling, Analytical techniques, Cesium, Strontium.

By several different methods, water, soil, and vegetation are regularly monitored and the results analyzed to ensure that Sandia Laboratories' operations are not adversely affecting the surrounding environment. The data from these tests, primarily for radiation levels, are presented for the period 1964 through December 1972. Based upon the environmental sampling data presented, Sandia Laboratories has not released any significant amount of radioactive or nonradioactive contaminants to the environment during the period January 1, 1964, through December 31, 1972. The soil sampling data show less activity than was obtained before the start-up of the two reactor facilities and the vegetation data on the average have remained

relatively constant. Water-sampling data are within the limited recommended for unidentified radionuclides according to AEC Manual Chapter 0524. (Houser-ORNL)
W73-11908

ENVIRONMENTAL MONITORING IN THE VICINITY OF THE LOS ALAMOS SCIENTIFIC LABORATORY - CALENDAR YEAR 1972.
Los Alamos Scientific Lab., N. Mex.

Available from NTIS, Springfield, Va., as Rpt. No. LA-5184. $5.45 per copy, $1.45 microfiche. Report No. LA-5184, March 1973, J. E. Herceg, compiler. 54 p, 22 fig, 31 tab, 25 ref.

Descriptors: *Monitoring, *Nuclear powerplants, *Effluents, Atmospheric pollution, Water pollution, Soil contamination, Surface waters, Groundwater, Data collections, Meteorological data, Weather data, On-site data collections, Hydrologic data, Sediment, Geology, Food chains, Public health, Administrative agencies.

The environmental monitoring program in effect at the Los Alamos Scientific Laboratory for calendar year 1972 is described. Results are given of routine monitoring of radiation levels and levels of radioactive and nonradioactive contaminants in the Laboratory environs, including the atmosphere, the Los Alamos water supply, local surface and ground water, sediments, and soils. Concentrations and levels are compared with applicable guide values and with results obtained at other geographical locations and locally during other reporting periods. Descriptions are given of special programs aimed at describing the physical and biological processes involved in the transport of Laboratory-generated radionuclides in liquid waste disposal areas. There is also a description of an environmental survey of certain AEC-controlled land parcels, as well as geologic, seismic, and meteorological studies of the Los Alamos area. Technical notes discuss the use of the honeybee as a biological indicator of radiocontamination, a new gamma-ray pulse height analyzer system intended for field use, an automated meteorological data acquisition system, and the determination of salt in pine trees near Los Alamos roadways. (Houser-ORNL)
W73-11909

INVESTIGATION OF THE UTILITY OF PARALLEL PHOTOMETRIC ANALYSIS AS A NEW APPROACH FOR ENVIRONMENTAL DETERMINATIONS,
Tennessee Univ., Knoxville.
R. L. Coleman.
Available from NTIS, Springfield, Va., as TID-26302; $5.45 in paper copy; $1.45 in microfiche. Report TID-26302, August 1971. 113 p, 19 fig, 25 tab, 66 ref.

Descriptors: *Analytical techniques, *Water analysis, *Color reactions, *Phosphates, Trace elements, Sulfur compounds, Sulfates, Turbidity, Photometry, Chemical analysis, Spectrometers, Colimetry, Fluorometry, Chemical reactions, Theis equation, Equilibrium.

Time-saving non-equilibrium analyses were made using a photometric instrument that compared samples and standards virtually simultaneously, and also controlled factors such as the degree of completion of the analytical reaction, temperature, order and time of reagent addition, and mixing. Application to analysis of natural waters containing 0-14 microgram/ml of phosphate gave a standard deviation of about 0.04 microgram/ml with 500-microliter samples. Trace levels of sulfur dioxide in 50-ml containers were analyzed that would have been difficult with larger sample-volume requirements. Applications are also described to turbimetric analysis of sulfate and to bio- and chemiluminescence studies. (See also W72-11708) (Bopp-ORNL)
W73-11916

ANNOTATED BIBLIOGRAPHY ON 14-MEV NEUTRON ACTIVATION ANALYSIS,
European Atomic Energy Community, Brussels (Belgium). Bureau Eurisotop.
R. Van Grieken, and J. Hoste.
Available from NTIS, Springfield, Va., as EURISOTOP-65; $7.60 in paper copy, $1.45 in microfiche. Report EURISOTOP-65, 1972. 295 p, 820 ref.

Descriptors: *Bibliographies, *Neutron activation analysis, *Pollutant identification, Biota, Trace elements, Analytical techniques, Radioactivity techniques, Sediments, Soil analysis, On-site investigations, Documentation, Indexing.

The scope is limited to work using neutrons from deuteron bombardment of tritium. Related bibliographies and journals were scanned. Reprints were requested from laboratories publishing in this field. Reprints were also requested in connection with future editions. Indexing is by author, element determined, and matrix analyzed (including biologic materials, geologic materials-sediments and soils, in-situ analyses, and in-stream analyses of liquids). A standard format summarizes technical data for each entry. (Bopp-ORNL)
W73-11919

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT - JULY-DECEMBER, 1971,
Battelle-Pacific Northwest Labs. Richland, Wash.
K. L. Kipp, Jr.
Available from NTIS Springfield, Va., as Report No BNWL-1680; $4.00 per copy, $1.45 microfiche. Report No BNWL-1680, Jan. 1973. 26 p, 3 fig, 6 tab, 5 ref.

Descriptors: *Nuclear powerplants, *Effluent, *Monitoring, *Assay, *Radioisotopes, Measurement, Groundwater, Radioactive tracers, Groundwater movement, Regulation, Standards, Tritium, Water pollution, Water pollution sources, Radioactive waste disposal, Public health.
Identifiers: Hanford site.

A report is prepared semi-annually to provide an evaluation of the status of groundwater contamination resulting from disposal of Hanford plant effluents. The data presented in this report were collected during the last six months of 1971. Of the wells that have been drilled to the groundwater on the Hanford project, about 200 are used for the routine surveillance of radionuclide movement through the sediments below the regional water table. The radionuclides Ruthenium-Rhodium and Tritium, as well as the nitrate ion, are readily transported by the groundwater and can be detected in groundwater at low concentrations relative to their respective drinking water standards. Therefore, these substances are used to trace the movement of contaminated groundwater away from the major disposal sites. The groundwater contamination pattern beneath Hanford at the present time can be divided into three source zones, based on the kinds and quantities of wastes disposed to ground at each location. Groundwater concentration data for these three source zones are presented. (Houser-ORNL)
W73-11923

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1972,
Battelle-Pacific Northwest Labs. Richland, Wash.
P. E. Bramson, and J. P. Corley.
Available from NTIS, Springfield, Va., as Report No BNWL-1727. $5.45 per copy, $1.45 microfiche. Report No BNWL-1727, April 1973. 72 p, 14 fig, 21 tab, 21 ref, 5 append.

Descriptors: *Environment, *Radioactivity, *Radioisotopes, *Measurement, *Assay, *Survey, *Water pollution, *Air pollution, *Soil contamination, Nuclear powerplants, Effluents, Water pollution sources, Public health, Columbia River, Food chains, Regulation, Standards.
Identifiers: *Hanford site, Concentration guide.

The 1972 Hanford Environmental Surveillance Program showed continued compliance of the Hanford contractors and their operations with applicable environmental standards. Samples of surface water, groundwater, air, foodstuffs, soil and vegetation were collected and analyzed for radioactivity. Columbia River water also received chemical and biological analysis. Additionally, measurements were made of river immersion exposure rate, surface exposure rate (1 meter above soil surface) and radionuclide deposition on soil surfaces and highways open to public access. Estimated 1972 dose to the average Richland resident from Hanford sources was less than 1 mrem (0.6% of the standard), about the same as for 1971. (Houser-ORNL)
W73-11924

A STUDY OF THE EXTRACTION AND DETERMINATION OF SOME ORGANO-MERCURY (II) COMPOUNDS,
Tennessee Univ., Knoxville.
J. A. Ealy.
Available from NTIS, Springfield, Va., as TID-26303; $5.45 in paper copy, $1.45 in microfiche. Report TID-26303, December 1971. 67 p, 14 fig, 13 tab, 35 ref.

Descriptors: *Gas chromatography, *Mercury, *Organic compounds, *Path of pollutants, Analytical techniques, Chromatography, Separation techniques, Solvent extractions, Food chains, Environmental effects, Public health.

The high toxicity of organo-mercury pollutants and the role of methylation in environmental pathways of Hg makes detection important. Two-stage extraction with benzene from aqueous biological phases, made 0.1-1 molar in iodide, gave about 96% yield. A gas-liquid chromatographic column (with on-column injection) separated 1-13 ng quantities of CH3HgC1, C2H5HgC1, and CH3C2H4HgC1. Attempts at liquid chromatography of organic-Hg (II) dithizonates on alumina gave inadequate separation. (Bopp-ORNL)
W73-11930

POTOMAC ESTUARY WASTEWATER TREATMENT PLANTS SURVEY.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 05D.
W73-12076

WATER QUALITY SURVEY OF THE POTOMAC ESTUARY EMBAYMENTS AND TRANSECTS.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.

1970 Data Report No 28, 1973. 15 p.

Descriptors: *Water quality, *Water analysis, *Chemical analysis, *Potomac River, *Estuaries, Sampling, Analytical techniques, Inorganic compounds, Organic compounds, Water chemistry, Pollutant identification, Water temperature, Nutrients, Data collections.

During 1970 water quality studies were continued in the Potomac estuary watershed. The purpose of these surveys was to determine existing water quality. Analytical methods and results are presented for the following parameters: water temperature, light extinction, conductivity, salinity, total phosphorus, inorganic phosphorus, total

Kjeldahl nitrogen, nitrate+nitrite, ammonia, dissolved oxygen, total organic carbon, total carbon, and chlorophyll a. (Woodard-USGS)
W73-12077

SURVEY RESULTS OF THE CHESAPEAKE BAY INPUT STUDY.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.

1969-70 Data Report No 31, 1973. 27 p.

Descriptors: *Water quality, *Water analysis, *Chemical analysis, *Chesapeake Bay, Sampling, Analytical techniques, Estuaries, Nutrients, Dissolved oxygen, Carbon, Biochemical oxygen demand, Chlorophyll, Pollutant identification, Water pollution sources, Sewage effluents.

In June 1969, a weekly sampling program was initiated of the Chesapeake Bay inputs. The purpose was to determine the nutrient loadings into the Chesapeake Bay from the six major drainage areas. The monitoring started with nine selected stations and increased to 12 in December 1969; surveillance terminated in August 1970. Chemical analyses were made for nutrients, dissolved oxygen, biochemical oxygen demand, carbon and chlorophyll a. Analytical methods and results are presented. (Woodard-USGS)
W73-12079

DETERMINATION OF CHLORIDE IN AQUEOUS SOIL EXTRACTS AND WATER SAMPLES BY MEANS OF A CHLORIDE-SELECTIVE ELECTRODE,
Norges Landbrukshoegskole, Vollebekk. Chemical Research Div.
A. R. Selmer-Olsen, and A. Oien.
Analyst, Vol 98, No 1167, p 412-415, June 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Water analysis, *Chlorides, *Electrodes, Colorimetry, Electrochemistry, Soil water, Chemical analysis.

The chloride contents of water samples and soil extracts may be determined with a chloride-selective electrode. The chloride content, at levels up to 100 mg per liter is determined in a solution that is 0.5 m with respect to ammonium nitrate and 0.03 m with respect to nitric acid. Comparison of this method with a colorimetric method showed no significant difference between the results obtained, but for water samples low in chloride (less than 3 mg per liter) the colorimetric method was more accurate. (Knapp-USGS)
W73-12088

DEOXYRIBONUCLEIC ACID BASE COMPOSITION AND TAXONOMIC POSITION OF GLUCOSE FERMENTING MARINE BACTERIA OF THE GENUS VIBRIO AND RELATED GENERA, (COMPOSITION EN BASES DE L'ADN ET POSITION TAXONOMIQUE DE BACTERIES MARINES FERMENTANT LE GLUCOSE, DU GENRE VIBRIO ET DES GENRES VOISINS),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
M. A. G. Bianchi.
Archiv fur Mikrobiologie, Vol 90, No 2, p 131-140, March 26, 1973. 1 fig, 3 tab, 16 ref.

Descriptors: *Systematics, *Separation techniques, Marine bacteria, Pathogenic bacteria, Pollutant identification, Cultures, Phenology.
Identifiers: *Vibrio, *Photobacterium, *Benecka, *DNA, Sample preparation, Aeromonas, Aeromonas spp.

DNA base composition of marine strains of genus Vibrio corroborate the results obtained by the adansonian method of classification. Comparisons of phenotypic and GC percent values of genera Photobacterium and Beneckea with the genus Vibrio show that differentiation between these three genera is not clear. Genus Vibrio can be separated in four groups. The first contains free-living marine strains. The second group includes the marine strains pathogenic to poikilothermic animals. The third group is composed of strains pathogenic to poikilothermic and homeothermic animals. The last group is made up of strains which, contrary to the other groups, have shown no specific requirement of sodium for growth. Each group has a typical ecologic localization. (Little-Battelle)
W73-12090

ON DOUBLE SAMPLING FOR STRATIFICATION AND ANALYTICAL SURVEYS,
Manitoba Univ., Winnipeg.
J. N. K. Rao.
Biometrika, Vol 60, No 1, p 125-133, April 1973. 8 ref.

Descriptors: *Statistical methods, *Estimating, Stratification, Sampling.
Identifiers: *Double sampling, *Variance, Non-response theory.

A simple method of double sampling for stratification is proposed and the classical non-response theory is obtained as a special case. The method leads to simple solutions for the optimal design of analytical surveys involving comparison of group means, when the groups are not identifiable in advance. (Little-Battelle)
W73-12092

SHORTCUTS TO SMALL-SAMPLE STATISTICS PROBLEMS,
Ethyl-Corp., Ferndale, Mich. Research and Development Dept.
P. F. Jackisch.
Chemical Engineering, Vol 80, No 13, p 107-110, June 11, 1973. 5 ref.

Descriptors: *Data processing, Statistical methods, Charts, Quality control.
Identifiers: *Nomographs, *Data scatter, Significance, Standard deviation.

Using the nomographs presented, it is possible to easily and rapidly determine the scatter in a set of data, significant differences between two sets of data, and whether some data should be discarded. The method is useful when the number of data points does not exceed 20. Sample applications of the procedure are included. (Little-Battelle)
W73-12093

A FLEXIBLE, LOW COST ALPHANUMERIC DISPLAY,
Institutal, Politehnic Bucuresti (Rumania).
P. D. Dimo, A. J. Gayraud, and N. N. Popovici.
Computer Design, Vol 12, No 6, p 77-82, June 1973. 8 fig, 3 ref.

Descriptors: *Electronic equipment.
Identifiers: *Data displays, *Alphanumeric displays.

Character generation techniques, character generators, and control logic for alphanumeric displays are discussed. Design criteria are given to aid in the selection of low cost displays. (Little-Battelle)
W73-12094

FORMAT CONVERSION USING A FIFO BUFFER,
Unidata Ltd., London (England).
C. Abellanas.
Computer Design, Vol 12, No 6, p 84-88, June 1973. 2 fig. 2 tab.

Descriptors: *Electronic equipment, *Data processing.
Identifiers: *Format conversion.

Asystem is described which allows for a number of different format conversions from an M-line bus to an N-line bus which is limited only by the length of the storage register. The converter's design is based on a special purpose first-in/first-out memory (FIFO) which has the ability to shift its information sideways. Operation of the system is described. (Little-Battelle)
W73-12095

A ROTATING RING-HEMISPHERICAL ELECTRODE FOR ELECTROANALYTICAL APPLICATIONS,
General Motors Corp., Warren, Mich. Electrochemistry Dept.
D-T. Chin.
Journal of the Electrochemical Society, Vol 120, No 5, p 631-635, May 1973. 6 fig, 7 ref.

Descriptors: *Electrochemistry, *Copper, *Iron, Heavy metals, Design, Aqueous solutions.
Identifiers: *Cyclic voltammetry, *Rotating ring-hemispherical electrode, Collection efficiency, Ion selection electrodes, Ferricyanide, Cupric chloride.

A study has been made of the combination of a rotating hemispherical electrode with aring electrode of a larger radius for use in investigations of reaction intermediates. Cyclic voltammetry is an acid copper solution was used to test the feasibility of the combination, and a ferricyanide/ferrocyanide redox reaction was used to measure the collection efficiency at the ring electrode. The collection efficiency was independent of the rotational speed in laminar flow, and its value was comparable to that obtained from the rotating ring-disk electrode theory. The results indicate that the ring-disk theory can be used as a rough approximation for the ring hemisphere electrode if the inner radius of the ring electrode is a minimum of 1.08 times the radius of the hemispherical electrode. Easy replacement of the central hemispherical electrode is a big advantage of this new geometry. This offers electrochemists an alternative choice where the use of a ring-disk electrode would fail to give a meaningful result and where frequent replacement of the disk electrode is needed. (Little-Battelle)
W73-12096

A POLYTHENE GRAPHITE ELECTRODE FOR VOLTAMMETRY,
Rome Univ. (Italy). Instituto di Chimica Analitica.
M. Mascini, F. Pallozzi, and A. Liberti.
Analytica Chimica Acta, Vol 43, No 1, p 126-131, March 1973. 5 fig, 2 tab, 8 ref.

Descriptors: *Iodides, *Oxidation-reduction potential, Electrodes, Ions.
Identifiers: *Ion selective electrodes, *Polyethylene graphite electrodes, *Voltammetry, *Cerium, *Hexacyanoferrate, Current-potential curves.

Polyethylene graphite electrodes were made by mixing spectral graphite with finely powdered thermoplastic polymer (polyethylene or methacrylic esters), placing the mixture in a mold, and thermosealing to a rigid polyethylene tube. Internal electrical contact was ensured by mercury. Current-potential curves were recorded in various supporting electrolytes such as KNO3, KC1, Na2SO4, H2SO4, HC1, HNO3, and HC104. Results of voltammetry with iodide, hexacyanoferrate, and cerium were also recorded. Reproducibility of results with the electrodes was better than 1 percent from day to day. (Little-Battelle)e
W73-12097

ACCUMULATION OF DIELDRIN IN AN ALGA (SCENEDESMUS OBLIQUUS), DAPHNIA MAGNA AND THE GUPPY (POECILIA RETICULATA),
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 05B.
W73-12098

SOME PROPERTIES OF PROBABILITY LATTICE SAMPLING,
California Univ., Los Angeles. Graduate School of Management.
R. J. Jessen.
Journal of the American Statistical Association, Vol 68, No 341, p 20-28, March 1973. 10 tab, 25 ref.

Descriptors: *Model studies, *Properties, Estimating.
Identifiers: *Probability lattice sampling, *Analysis of variance, Estimators.

The accuracy of three estimators of sampling variance using nonreplacement probability lattice samples was determined empirically on a microuniverse. A simple split-sample scheme, although biased, was superior to the unbiased Horvitz-Thompson and Yater-Grundy estimators. A weighted ANOVA type of model for representing two-way universes with unequal cell sizes is presented and tested empirically to determine how well it can account for sources of sampling variability using 0, 1 and 2-way controls with EP (equal probability) and PNR (probability proportional to size with non-replacement) samples. (Holoman-Battelle)
W73-12099

AN EVALUATION OF TEN PAIRWISE MULTIPLE COMPARISON PROCEDURES BY MONTE CARLO METHODS,
Illinois Univ., Urbana. Dept. of Agronomy.
S. G. Carmer, and M. R. Swanson.
Journal of the American Statistical Association, Vol 68, No 341, p 66-74, March 1973. 10 tab, 17 ref.

Descriptors: *Statistical methods, *Computer models, Testing procedures, Data processing.
Identifiers: *Error rates, *Decision rates, *Analysis of variance, *Least significant difference, Scheffe's test, Tukey's test, Student-Newman-Keuls test.

Computer simulation techniques were used to study the Type I and Type III error rates and the correct decision rates for ten pairwise multiple comparison procedures. Results indicated that Scheffe's test, Tukey's test, and the Student-Newman-Keuls test are less appropriate than either the least significant difference with the restriction that the analysis of variance F value be significant at alpha equal .05, two Bayesian modifications of the least significant difference, or Duncan's multiple range test. Because of its ease of application, many researchers may prefer the restricted least significant difference. (Little-Battelle)
W73-12100

BAYESIAN ACCEPTANCE-SAMPLING SCHEMES FOR TWO-SIDED TESTS OF THE MEAN OF A NORMAL DISTRIBUTION OF KNOWN VARIANCE,
Vidyodaya Univ. of Ceylon, Nugegoda. Dept. of Mathematics.
R. A. Dayananda, and I. G. Evans.
Journal of the American Statistical Association, Vol 68, No 341, p 131-136, March 1973. 14 ref.

Descriptors: *Statistical methods, Sampling.
Identifiers: *Acceptance sampling, *Sample size, *Hypothesis testing.

The problem of deciding whether the mean of theta of a normal distribution of known variance lies in a specified finite interval (theta minus, theta plus) is discussed. Consideration is given to prior information on theta and to quadratic and piecewise linear utility structures. Computer-aided methods are described for obtaining the optimal decision rule given a sample of observations and for obtaining the optimal sample size when the sampling cost is a linear function of the sample size. Some simpler approximate methods are also described. (Little-Battelle)
W73-12101

HETEROGENEOUS-SITE GLASS MEMBRANE POTENTIALS-A SOLID-STATE APPROACH,
North Carolina Univ., Chapel Hill. Lab. of Chemistry.
R. P. Buck.
Analytical Chemistry, Vol 45, No 4, p 654-665, April 1973. 11 fig, 2 tab, 63 ref.

Descriptors: *Electrochemistry, *Electrical properties, *Model studies, *Aqueous solutions, *Hydrogen ion concentration, Mathematical studies, Mathematical models.
Identifiers: *Glass electrodes, Ion selective electrodes, Membrane electrodes, Accuracy.

Previously no single potential response function for glass electrodes accounted for the step-wise response of heterogeneous-site glass in mixed electrolytes (varying pH at constant pM). A new theory encompasses both of Nicolsky's variant ion exchange theories and Eisenman's n-type non-ideal behavior by introducing the assumption that only a fraction of cations in a glass membrane are mobile and contribute to the diffusion potential. Mobile defects, which may be few or nearly all cations, are presumed to be in equilibrium with lattice-like ions, defect sites, and vancancies. At low Al203 levels in a typical Na20-Al20-Si02 glass, two Nernstian pH regions are predicted, while at higher levels a shoulder followed at high pH by half Nernstian response is predicted. Experimental data are used to test theory. In the limit of zero heterogeneity, a new expression for pH electrode response is found which fits existing data and gives another meaning to n-type non-ideal behavior. (Little-Battelle)
W73-12102

MORPHOLOGICAL, BIOCHEMICAL, AND GROWTH CHARACTERISTICS OF PSEUDOMONAS CEPACIA FROM DISTILLED WATER,
Center for Disease Control, Phoenix, Ariz. Environmental Microbiology Section.
L. A. Carson, M. S. Favero, W. W. Bond, and N. J. Petersen.
Applied Microbiology, Vol 25, No 3, p 476-483, March 1973. 4 fig, 1 tab, 18 ref.

Descriptors: *Growth rates, *Isolation, *Pollutant identification, Cytological studies, Pesticide toxicity, Aerobic bacteria, Risistance, Cultures, Water temperature, Antibiotics (Pesticides).
Identifiers: *Distilled water, *Pseudomonas cepacia, *Cell morphology, *Biochemical characteristics, Bacterial physiology, Biochemical tests, Survival, Ampillicin, Polymyxin-B, Colistin, Gentamicin, Cephalothim, Cephaloridine, Chloramphenicol, Sulfonamide, Nalidixic acid, Tetracycline, Kanamycin.

Studies were conducted on three strains of Pseudomonas cepacia isolated and maintained in distilled water and on a laboratory-subcultured strain transferred to distilled water. Optimum growth rates and maximum population yields of the four strains in distilled water were obtained at 37 C, although high population levels (1,000,000 - 10,000,000/ml) were reached and maintained over extended incubation periods at temperatures from 18C to 42C. Two strains were able to grow in distilled water at temperatures ranging from 12C to 48C and to survive 48 h and 21 days at 50C and 10C, respectively. Cells from distilled water cultures inoculated into Trypticase soy broth showed an immediate two- to three-log drop at upper and lower temperature limits; survivors were able to initiate logarithmic growth. Results obtained in morphological, biochemical, and antibiotic tests affirmed the strain differences noted in growth studies. (Holoman-Battelle)
W73-12103

IDENTIFICATION OF STAPHYLOCOCCUS AUREUS BY SIMULTANEOUS USE OF TUBE COAGULASE AND THERMONUCLEASE TESTS,
Sacramento Medical Center, Calif. Clinical Microbiology Lab.
A. L. Barry, R. V. F. Lachica, and F. W. Atchison.
Applied Microbiology, Vol 25, No 3, p 496-497, March 1973. 1 tab, 4 ref.

Descriptors: *Pollutant identification, *Separation techniques, Cultures, Quality control, Pathogenic bacteria.
Identifiers: *Staphylococcus aureus, Accuracy, Tube coagulase tests, Thermonuclease tests.

The toluidene blue deoxyribonucleic acid (DNA) agar (TDA) technique was adapted to permit detection of thermonuclease (heat-stable nuclease) at the same time that a coagulase test is performed to eliminate possible errors in distinguishing Staphylococcus aureus from other Micrococcaceae. Isolated colonies were grown on brain heart infusion (BHI) broth at 35 C for 2-6 hours, divided into three parts, one for coagulase tests, one for thermonuclease tests, and one for growth if retesting were necessary. Experience using the tests showed that valid discrepancies between two tests are rare enough to permit the use of one test as a control of the other. (Little-Battelle)
W73-12104

EFFECT OF ACETATE UPON THE FORMATION OF ACETOIN IN KLEBSIELLA AND ENTEROBACTER AND ITS POSSIBLE PRACTICAL APPLICATION IN A RAPID VOGES--PROSKAUER TEST,
Ulleval Hospital, Blindern (Norway). Dept. of Microbiology.
K. Bryn, J. C. Ulstrup, and F. C. Stormer.
Applied Microbiology, Vol 25, No 3, p 511-512, March 1973. 12 ref.

Descriptors: *Separation techniques, Cultures, Pollutant identification.
Identifiers: *Enterobacter, *Klebsiella, *Acetates, Voges-Proskauer test, Biochemical tests.

Acetate stimulates the formation of acetoin during 1-h incubation of Voges-Proskauer-positive strains of Klebsiella and Enterobacter. Of these organisms, 124 of 126 strains were recognized as positive in the presence of acetate, and 106 were recognized as positive in its absence. (Little-Battelle)
W73-12106

DISCREPANCIES IN THE ENUMERATION OF ESCHERICHIA COLI,
North Carolina State Univ., Raleigh. Dept. of Food Science.
B. Ray, and M. L. Speck.
Applied Microbiology, Vol 25, No 4, p 494-498, April 1973. 1 fig, 7 tab, 11 ref.

Descriptors: *E. coli, *Foods, *Cultures, *Pollutant identification, Enteric bacteria, Coliforms, Methodology, Inhibition.
Identifiers: *Enumeration, *Most probable number test, *Pour plate method, Culture media, Selective media, Surface-overlay method, Trypticase soy agar, Violet red-bile agar, Brilliant Green-bile broth, Lauryl sulfate broth.

Stationary-phase cells of Escherichia coli from stock cultures, reconstituted nonfat dry milk, meat broth, crab meat and liquid whole egg, were enumerated by the pour plate method on Trypticase soy agar containing 0.3 percent yeast extract (TSYA), violet red-bile agar, and desoxycholate-lactose agar, and by the most-probable-number method in Brilliant Green-bile broth and lauryl sulfate broth. Maximum counts were assumed to be those on TSYA. In general, numbers detected were lower with the selective solid media and higher with the selective liquid media. Inhibitory effects, especially on selective solid media varied with the strains of E. coli. The lower detection on selective solid media was partly due to the stress induced in some cells by the temperature of the melted media used in the pour plate method. These cells apparently failed to repair and form colonies in the selective media. Improved detection on the selective solid media was achieved by using 1 percent nonfat milk solids, 1 percent peptone, or 1 percent MgSO4.7H2O in the dilution blanks. Higher detection on selective agar media was effected by surface plating or by surface overlay plating of the cells. The surface-overlay method appeared to be superior for the direct enumeration of E. coli in foods. (Holoman-Battelle)
W73-12107

EXPERIENCE WITH AN IMAGE-ANALYZING COMPUTER IN VIRUS PLAQUE MEASUREMENTS,
Arzneimittelforschung G.m.b.H., Vienna (Austria).
W. Scheirer.
Applied Microbiology, Vol 25, No 4, p 641-643, April 1973. 3 fig, 2 tab, 3 ref.

Descriptors: *Measurement, *Viruses, *Pollutant identification, Laboratory equipment, Research equipment, Automatic control, Automation, Cultures.
Identifiers: *Image-analyzing computer, *Plaque counts, Plaque-reduction tests, Vesiscular stomatitis virus, Cowpox virus.

A description is given of the Imanco-Quantimet 720 image-analyzing computer which has been used for counting virus plaques in different test systems. With this apparatus, an object is picked up by a TV camera and electronically resolved into 500,000 picture spots. These are scanned row by row for difference in gray density. The gray difference, which is necessary to detect the plaques against the stained cell monolayer, must be determined for each test series. The plaques detected by the instrument can also be discriminated by size, as measured in picture spots. The results can be printed out either as the number of plaques as discriminated by a certain gray difference, as the total area of plaques, or as the sum of all plaque diameters. In determining the possibility of using this apparatus in virology, three test systems were used: (1) mouse L-929 cells challenged with vesiscular stomatitis virus, strain Indiana; (2) chicken embryo fibroblasts challenged with cowpox virus, strain Brighton; and (3) human phimosis cells challenged with VSV. System 1 presented no problems and the measurements obtained by hand counting corresponded well with computer results. Adjustments were made for optimal results with system 2 but good agreement was found with hand-counting values. Useful results were not obtained with system 3. The image-analyzing computer is most helpful for large screening programs, involving plaque-reduction tests, because of the extremely fast and reliable plaque-number determinations. (Holoman-Battelle)
W73-12108

SPECIFIC IDENTIFICATION OF ENTEROVIRUSES BY IMMUNO-ELECTRON MICROSCOPY USING A SERUM-IN-AGAR DIFFUSION METHOD,
Toronto Univ. (Ontario). School of Hygiene.
N. Anderson, and F. W. Doane.
Canadian Journal Microbiology, Vol 19, No 5, p 585-589, May 1973. 4 fig, 3 tab, 7 ref.

Descriptors: *Pollutant identification, *Methodology.
Identifiers: *Immuno-electron microscopy, *Enterovirus, *Serum-in-agar diffusion method, Echovirus, Agar-diffusion technique, Coxsackievirus, Poliovirus, Serotypes, Sensitivity.

Rapid type-specific identification of enteroviruses was performed by immuno-electron microscopy on crude cell-culture isolates, using an agar-diffusion technique in which the typing sera were incorporated in the agar. Seventeen virus samples which consisted of 11 different enterovirus types showed no cross reaction on when tested against 15 enterovirus antisera. Specific virus identification, based on the presence of visible antigen-antibody complexes, was not dependent on optimal dilutions of antiserum, but could be achieved with a variety of dilutions. The minimum amount of virus that could be detected by this method was about 100 times less than that detectable by electron microscopy in the absence of antiserum. (Holoman-Battelle)
W73-12109

ISOLATION AND CHARACTERIZATION OF THERMOSENSITIVE ESCHERICHIA COLI MUTANTS DEFECTIVE IN DEOXYRIBONUCLEIC ACID REPLICATION,
Columbia University, New York. Dept. of Biological Sciences.
J. A. Wechsler, V. Nusslein, B. Otto, A. Klein, and F. Bonhoeffer.
Journal of Bacteriology, Vol 113, No 3, p 1381-1388, March 1973. 7 tab, 9 ref.

Descriptors: *E. coli, Temperature, Cultures, Separation techniques.
Identifiers: *Isolation, *Characterization, *Autoradiography, *DNA replication, Mutants, Biochemistry, DNA, Culture media, Complementation tests.

Thermosensitive deoxyribonucleic acid replication-defective mutants have been isolated by using an autoradiographic selection method. The mutants have been analyzed genetically and biochemically. Some of the mutants show thermosensitivity of in vitro deoxyribonucleic acid replication. These can be classified into three groups according to their behavior in in vitro complementation assays. This classification is congruent with that obtained by genetic mapping by using cotransduction frequencies with selected markers in P1 transduction analysis. (Little-Battelle)
W73-12110

GRAPHS, TABLES AND DISCUSSION TO AID IN THE DESIGN AND EVALUATION OF AN ACCEPTABLE SAMPLING PROCEDURE BASED ON CUMULATIVE SUMS,
Sandia Labs., Albuquerque, N. Mex.
R. R. Prairie, and W. J. Zimmer.
Journal of Quality Technology, Vol 5, No 2, p 58-66, April 1973. 8 fig, 3 tab, 3 ref.

Descriptors: *Sampling, *Statistical methods, Quality control, Testing procedures.
Identifiers: *Acceptance sampling, *Attributes.

An acceptance sampling procedure for attributes inspection proposed by Beattie seems well suited for situations when production is continuous, sampling is destructive, a constant sampling rate is required, and discrimination between two quality levels is required with a small sample size. The Beattie procedure is described, the underlying mathematics are presented, strengths and weaknesses are disclosed and graphs are presented for determining a plan. (Little-Battelle)
W73-12111

SOME EXACT TESTS OF HYPOTHESES ABOUT GRUBBS'S ESTIMATORS,
Agricultural Research Council, Edinburgh (Scotland). Unit of Statistics.
G. K. Shukla.
Biometrics, Vol 29, No 2, p 373-377, June 1973. 7 ref.

Descriptors: *Instrumentation, *Statistical methods, Measurement, Quality control, Testing procedures.
Identifiers: *Hypothesis testing, *Precision.

When two instruments or techniques are used to measure the same item, the measurement precisions may be estimated using a method proposed by Grubbs (1948). Certain tests given by earlier authors are generalized. Using this general result, some exact tests of certain hypothesis are obtained for which only approximate results were available. The results can also be used to construct exact confidence intervals for the relative precision of two instruments. (Little-Battelle)
W73-12112

THE EFFECTS OF AMMONIUM AND PHOSPHATE ENRICHMENTS ON CHLOROPHYLL A, PIGMENT RATIO AND SPECIES COMPOSITION OF PHYTOPLANKTON OF VINEYARD SOUND,
Marine Biological Lab., Woods Hole, Mass.
Boston Univ. Marine Program.
For primary bibliographic entry see Field 05C.
W73-12116

DELAYED-INCUBATION MEMBRANE-FILTER TEST FOR FECAL COLIFORMS,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
R. H. Taylor, R. H. Bordner, and P. V. Scarpino.
Applied Microbiology, Vol 25, No 3, p 363-368, March 1973. 5 tab, 14 ref.

Descriptors: *Pollutant identification, *Monitoring, Water quality, Water pollution, Waste water pollution, Water pollution sources, Methodology, Bioindicators, Ohio River.
Identifiers: *Fecal coliforms, *Delayed incubation membrane filter test, Date interpretation, Culture media, Five Mile Creek (Ohio), Licking River (Ohio), Mill Creek (Ohio), Burnet Woods Lake (Ohio), VFC holding medium.

A delayed-incubation membrane-filter technique for fecal coliforms was developed and compared with the immediate fecal coliform test described in 'Standard Methods for the Examination of Water and Wastewater' (13th ed., 1971). Laboratory and field evaluations demonstrated that the delayed-incubation test, with the use of the proposed vitamin-free Casitone holding medium, produces fecal coliform counts which very closely approximate those from the immediate test, regardless of the source or type of fresh-water sample. Limited testing indicated that the method is not as effective when used with saline waters. The delayed-incubation membrane-filter test will be especially useful in survey monitoring or emergency situations when the standard immediate fecal coliform test cannot be performed at or near the sample site or when time and temperature limitations for water sample storage can be met. The procedure can also be used for analyzing the bacterial quality of water or waste discharge by a standardized procedure in a central examining laboratory remote from the sample source. (Holoman-Battelle)
W73-12120

TYPING OF SALMONELLA WELTEVREDEN STRAINS BY MEANS OF LYSIS PATTERNS OF SYMBIOTIC PHAGES,
Haryana Agricultural Univ., Hissar (India). Dept. of Veterinary Bacteriology and Hygiene.
D. N. Garg, and I. P. Singh.
Antonie van Leeuwenhoek, Vol 39, No 1, p 41-50, 1973. 5 tab, 2 ref.

Descriptors: *Bacteriophage, Hosts, Bioindicators, Isolation, Aerobic bacteria, Spatial distribution, Sewage, Water pollution, Oysters, Crustaceans, Birds, Poultry, Sea water, Reptiles, Mammals, Frogs, Human diseases, Enteric bacteria.
Identifiers: *Phage typing, *Salmonella weltevreden, *Lysogenicity, *Characterization, Biochemical characteristics, Serotypes, Culture media, Distilled water, Biochemical tests, Lysogeny.

A typing scheme for Salmonella weltevreden using the lysogenicity and lysis patterns of their carried phages is presented. Six strains of S. weltevreden were selected for use as indicator strains for recognizing the lysis patterns of the carried phages. Two hundred and forty-five strains were examined and 207 were grouped in concurrence with the 15 lysis patterns obtained out of 64 theoretically possible. Lysis pattern I (all 6 indicator strains lysed by the carried phage) included 24.5 percent of the strains. Thirty-eight strains (15.5 percent) were grouped as untypable because their lysates did not lyse any of the indicator strains. No correlation could be established between the lysis patterns of carried phages and the host and geographic distribution of S. weltevreden. (Holoman-Battelle)
W73-12121

ISOLATION OF NEW METHANOL-UTILIZING BACTERIA AND ITS THIAMINE-REQUIREMENT FOR GROWTH,
Sanraku-Ocean Co. Ltd., Fujisawa (Japan). Central Research Lab.
K. Kouno, T. Oki, H. Nomura, and A. Ozaki.
Journal of General and Applied Microbiology, Vol 19, No 1, p 11-21, February 1973. 2 fig, 1 tab, 25 ref.

Descriptors: *Isolation, *Nutrient requirements, *Environment, Sewage, Activated sludge, Humus, Mud, Vitamins, Organic compounds, Cultures, Pollutant identification, Aerobic bacteria.
Identifiers: *Methanol, *Biochemical characteristics, *Methanomonas methylovora, *Methanol bacteria, *Thiamine, Substrate utilization, Culture media, Petroleum refinery, Characterization, Biochemical tests, Bacterial physiology, Cell morphology, DNA.

Approximately 0.1 g of soil, activated sludge, sewage, compost, humus, and materials around a petroleum refinery were placed in a Monod shaking tube containing 10 ml of basal methanol medium. The tube was incubated with reciprocal shaking at 28-30 degrees for 3 days after several subcultures, methanol-utilizing bacteria were plated and picked up after incubating for 5 days at 28 degrees. Nutrient agar and other media enriched with peptone were used to detect the presence of bacteria capable of utilizing carbon sources other than methanol. Vitamin and amino acid requirements were determined by using a minimum medium omitting yeast extract, biotin, and thiamine hydrochloride from the basal medium. These nonpigmented bacteria were capable of growing only on methanol and showed no growth on ordinary nutrient media. They were identified as a new species, Methanomonas methylovora. The organisms are gram-negative, non-sporeforming rods, 0.4 to 0.7 micron by 1.0 to 4.0 microns in size, having a single polar flagellum. GC content of DNA is 51.2 to 53.6 percent. Some of them required a relatively high concentration of thiamine as an essential factor for cell growth, and produced an intracellular yellow pigment on methanol-containing agar medium. (Holoman-Battelle)
W73-12122

FATTY ACID FINGERPRINTS OF STREPTOCOCCUS MUTANS GROWN IN A CHEMOSTAT,
Manchester Univ. (England). Dept. of Bacteriology and Virology.
D. B. Drucker, C. J. Griffith, and T. H. Melville.
Microbios, Vol 7, No 25, p 17-23, January 1973. 1 fig, 2 tab, 30 ref.

Descriptors: Cultures, Pollutant identification, Gas chromatography, Streptococcus, Pathogenic bacteria.
Identifiers: Streptococcus mutans, Gas liquid chromatography, Chemostat, Sample preparation, Fatty acids, Characterization, Culture media, Fingerprinting, Chromatograms.

Streptococcus mutans D282 and Streptococcus mutans JC2 were grown in a chemostat, the latter organism being grown under various experimental conditions. Freeze-dried cells were methylated and methyl fatty acid esters examined by gas-liquid chromatography to determine the effect of experimental growth parameters on chemotaxonomic GLC fingerprints. Changes in experimental conditions slightly altered the JC2 fingerprint, especially oxygenation which resulted in unsaturated fatty acid production. Changes in the JC2 fingerprints were less than the difference in fingerprints for JC2 and D282 grown under identical conditions. Little-Battelle
W73-12123

PARTIAL CHARACTERIZATION OF MYCOBACTERIOPHAGE R1 PARTICLES SURVIVING CHLOROFORM TREATMENT,
Ohio State Univ., Columbus. Dept. of Medical Microbiology.
M. A. Fleer, and B. U. Bowman.
Microbios, Vol 7, No 25, p 37-44, January 1973. 5 fig, 16 ref.

Descriptors: *Cultures, Pollutant identification, Enzymes, Bacteriophage, Viruses.
Identifiers: *Mycobacteriophage, *Characterization, *Survival, *Inactivation, Phages, Chloroform, Mycobacterium smegmatis.

Approximately 99 percent of mycobacteriophage R1 is inactivated by chloroform treatment. Phage R1 surviving chloroform treatment (chloroform survivors) form smaller plaques than untreated phage when both are plated and compared on mycobacterium smegmatis ATCC 607. However, when progeny of chloroform survivors are picked and plated they form normal plaques. DNase and RNase had essentially no effect on either untreated phage or chloroform survivors. Trypsin had no effect on untreated phage but completely inactivated chloroform survivors. Anti-R1 serum inactivated both untreated phage and chloroform survivors. However, chloroform survivors were inactivated to a greater extent. Chloroform survivors appear to be different from native phage R1 and the differences may be related to the infectious process of the virion-host cell system. (Little-Battelle)
W73-12124

AMMONIA ASSIMILATION IN BLUE-GREEN ALGAE,
California Univ., Berkeley. Dept. of Bacteriology and Immunology.
For primary bibliographic entry see Field 05B.
W73-12125

OCCURRENCE AND DISTRIBUTION OF CYANOPHAGES IN PONDS, SEWAGE AND RICE FIELDS,
Central Rice Research Inst., Cuttack (India). Dept. of Blue-Green Algae.
P. K. Singh.
Archiv fur Mikrobiologie, Vol 89, No 2, p 169-172, February 5, 1973. 2 tab, 11 ref.

Descriptors: *Cyanophyta, *Plant viruses, *Nuisance algae, Ponds, Sewage, Rice, Cultivated lands, Aquatic algae, Aquatic plants, Pollutant identification, Water sampling, Aquatic habitats.
Identifiers: *Plectonema boryanum, *Cyanophages, Culturing techniques, Microcystis, Anabaenopsis, Phormidium, Oscillatoria.

Observations have been made on the occurrence and distribution of cyanophages active against the blue-green alga Plectonema boryanum together with fluctuations of blue-green algae in permanent freshwater ponds, sewage and rice fields. Water samples were collected monthly and the genera of blue-green algae present in them identified. The samples were filtered, treated with chloroform, mixed with a concentrated culture of P. boryanum and plated by the double agar layer technique (Adams, 1959). Plaques were counted on the third and seventh day of plating, further isolated, multiplied on the alga, and filtered through 0.45-micron millipore filters. Two distinct types of cyanophages, i.e., clear (virulent) and turbid (lysogenic) plaque-forming strains were observed in the natural habitat. The genera of algae observed most were Microcystis, Anabaenopsis, Phormidium and Plectonema. The sewage main drain contained mostly species of Phormidium and Oscillatoria. Presence of cyanophages in ponds and variation in their titre indicated that cyanophages might affect the blue-green algal population in natural habitats. The occurrence of high titre of viruses showed that blue-green algae in rice fields are infected by them. (Holoman-Battelle)
W73-12126

CHARACTERIZATION OF THIOBACILLUS SPECIES BY GAS-LIQUID CHROMATOGRAPHY OF CELLULAR FATTY ACIDS,
Rochester Univ., N.Y. Dept. of Biology.
A. D. Agate, and W. Vishniac.
Archiv fur Mikrobiologie, Vol 89, No 3, p 257-267, February 9, 1973. 5 fig, 2 tab, 14 ref.

Descriptors: *Separation techniques, Gas chromatography, Thiobacillus ferrooxidans, Pollutant identification, Cultures.
Identifiers: *Characterization, *Gas liquid chromatography, *Thiobacillus ssp, Chromatograms, Culture media.

Fatty acids of 18 strains representing 10 species of Thiobacillus were extracted from whole cells and examined as methyl esters by gas-liquid chromatography. Both visual and quantitative comparison of the resulting chromatograms for the presence and relative amounts of major peaks allowed rapid differentiation between such closely related species as Thiobacillus neapolitanus and T. thioparus and of eight other species. Except for a feature common to all thiobacilli tested, T. thiooxidans, T. neapolitanus and T. thioparus each possessed a characteristic fatty acid methyl ester profile that was exhibited by all the strains of that species. Hence, the thiobacilli could be divided into three distinct groups. It was possible to use the gas-liquid chromatographic patterns of the cellular fatty acids for rapid identification or grouping of these microorganisms since the fatty acid composition of the genus Thiobacillus thus appeared to be of taxonomic significance. (Little-Battelle)
W73-12127

A SUBMERSIBLE SPECTRORADIOMETER AND DATA ACQUISITION SYSTEM,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
W. S. Duval, T. J. Brown, and G. H. Geen.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 313-316, February 1973. 4 fig, 1 ref.

Descriptors: *Instrumentation, *Data processing, *On-site data collections, *Laboratory tests, *Design data, Light, Calibrations, Aquatic environment, Optical properties, Water temperature.
Identifiers: *Spectroradiometer, *Performance evaluation, *Submersible light meter, Detection limits, Sensitivity, Reproducibility, Marine environment, Spectral data, Optical systems.

A submersible light meter that measures and records irradiance versus wavelength over the

range 400-750 nm is described. A data acquisition system coupled to the radiometer permits collection and processing of large numbers of field observations. The incident spectrum is determined by an optical system incorporating a wedge interference filter monochromator and photodiode. Recorded data are converted to spectra irradiance (microW/sq cm/nm) at 5-nm intervals by applying standard lamp calibration and immersion factor corrections. Minimum detectable radiation varies from 0.05 to 0.016 microW/sq cm/nm depending on wavelength. Response of the meter is not affected by temperature in the range of 3.5-23.0 C and angular dependence of the light collector follows Lambert's Cosine Law for incident angles less than 55 degrees from the vertical. Changes in the spectral composition of incident light with depth are demonstrated for two lakes. (Holoman-Battelle)
W73-12135

THE LIFE HISTORY OF THE ALDERFLY, SIALIS AEQUALIS BANKS, IN AN ACID MINE STREAM,
Marshall Univ., Huntington, W. Va. Dept. of Biological Sciences.
J. E. Woodrum, and D. C. Tarter.
The American Midland Naturalist, Vol 89, No 2, p 360-368, April 1973. 3 fig, 20 ref.

Descriptors: *Life history studies, *Acid streams, Growth rate, Growth stages, Food habits, Life cycles, Acid mine water, Benthos, Aquatic insects.
Identifiers: *Alderflies, Sialis aequalis Twelvepole Creek (West Virginia), Megaloptera.

The life history of the alderfly, Sialis aequalis Banks, was studied intensively in an acid mine stream, Camp Creek of Twelvepole Creek, Wayne County, West Virginia, Between July 1970 and June 1971. Alderfly larvae are detritivorous, supplementing their diet with chironomid larvae in summer and autumn. Length frequency distributions indicate that larvae require 1 year to complete the life cycle. The larvae attain their greatest growth rate from June to July (83 percent). The entire larval population required 2-6 days for departure from the stream. Pupation began in a moist sandbank in mid-March and l.sted 4-5 weeks. Emergence of adults began in late April and reached a peak in early May. Total egg counts from 10 females ranged from 402 to 818 (mean, 657). Adult life span was the 2 weeks in nature and ranged from 1 to 7 days under laboratory conditions (mean, 5.7 days). Adults do not feed. (Little-Battelle)
W73-12136

FEASIBILITY OF REMOTE DETECTION OF WATER POLLUTANTS AND OIL SLICKS BY LASER-EXCITED RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
M. Ahmadjian, and C. W. Brown.
Environmental Science and Technology, Vol 7, No 5, p 452-453, May 1973. 4 fig, 3 ref.

Descriptors: *Remote sensing, *Waste identification, *Pollutant identification, *Data collections, Water pollution, Oil spills, Pollutants, Water pollution sources, Spectrometers, Anions, Instrumentation, Automation, Nitrates.
Identifiers: *Laser-excited Raman spectroscopy, Raman spectra, Sensors.

A simple, inexpensive optical system has been constructed for obtaining Raman spectra of samples located remotely from the instrument. The capabilities of this system were demonstrated by obtaining spectra of dilute solutions of NO3 and of oil films on the surface of water with the sample located 21 ft from the instrument. Raman spectra were measured on a Spex Industries Model 1401 double monochromator using photon-counting detection and a CRL Model 52A argon-ion laser emitting at 4880 or 5145A. A schematic diagram is given of the optical system which utilizes a small diameter laser beam and a large diameter collimated scattered beam thus allowing both beams to traverse the same optical path between the instrument and the sample. Such an arrangement also allows an extension of the light path to almost any realistic distance. (Holoman-Battelle)
W73-12137

PHENOTYPIC CHARACTERIZATION OF BENECKEA PARAHAEMOLYTICA: A PRELIMINARY REPORT,
Hawaii Univ., Honolulu. Dept. of Microbiology.
P. Baumann, and L. Baumann.
Journal of Food and Milk Technology, Vol 36, No 4, p 214-219, April 1973. 17 fig, 3 tab, 19 ref.

Descriptors: *Pollutant identification, *Nutrient requirements, *Methodology, Marine bacteria, Enteric bacteria, Pathogenic bacteria, Isolation, Sea water, Surface waters.
Identifiers: *Characterization, *Cell morphology, *Bacterial physiology, *Beneckea spp, *Phenotype, Biochemical tests, Substrate utilization, Feces, Culture media, L-leucine, D-galactose, L-histidine, Sucrose, DL-beta-hydroxybutyrate, Voges-Proskauer test, L-arabinose, Glucuronate, Lipase, p-Hydroxybenzoate, Putrescine.

Eighty-six strains which were isolated from cases of gastroenteritis and had the general properties of the genus Beneckea were submitted to an extensive nutritional, physiological, and morphological characterization. The results indicated that this collection of strains, which included the type strain of Beneckea parahaemolytica, was phenotypically homogeneous and distinguishable from the other known species of Beneckea by multiple, unrelated, phenotypic traits. When grown in liquid medium, strains of B. parahaemolytica had single, sheathed, polar flagella; when grown on solid medium, these strains had unsheathed, peritrichous flagella in addition to the sheathed, polar flagellum. Additional traits of use for differentiation of these species from the remaining species of the genus Beneckea were the ability of B. parahaemolytica to grow at 40 C, utilize D-galactose, L-leucine, L-histidine, and putrescine and the inability to utilize sucrose, DL-beta-hydroxybutyrate or give a positive Voges-Proskauer reaction. The validity of some of the traits previously used to identify B. parahaemolytica as well as the possible difficulties encountered in the identification of this organism from marine sources are considered. (Holoman-Battelle)
W73-12138

CARBON SOURCE UTILIZATION TESTS AS AN AID TO THE CLASSIFICATION OF NON-FERMENTING GRAM-NEGATIVE BACTERIA,
Central Public Health Lab., London (England).
National Collection of Type Cultures.
J. J. S. Snell, and S. P. Lapage.
Journal of General Microbiology, Vol 74, No 1, p 9-20, January 1973. 4 fig, 4 tab, 21 ref.

Descriptors: *Classification, *Pollutant identification, *Fermentation, Enzymes, Nutrient requirements, Computer programs, Systematics, Variability, Cultures, Viability, Nitrogen, Amino acids, Computers, Aerobic bacteria, Pathogenic bacteria, Soil bacteria, Aquatic bacteria, Enteric bacteria, Coliforms.
Identifiers: *Substrate utilization, *Gram-negative bacteria, *Biochemical tests, *Carbon source utilization tests, Culturing techniques, Bacterial physiology, Numerical taxonomy, Growth media, Reproducibility, Culture media, Acinetobacter spp, Alcaligenes odorans, Bordetella spp, Chromobacterium spp, Flavobacterium, Loefflerella mallei, Moraxella, Neisseria, Pseudomonas spp.

Difficulties in the use of carbon source utilization (CSU) tests for the classification and identification of bacteria prompted an investigation of some of the factors which affect the results. The classification derived by numerical taxonomy on the results of CSU tests was compared with that derived from results of conventional tests. One hundred eighty-seven strains of Gram-negative bacteria, chiefly nonfermentative, of the genera Acinetobacter, Alcaligenes, Loefflerella, Bordetella, Chromobacterium, Flavobacterium, Moraxella, Neisseria, and Pseudomonas were used in the investigation. Cultures were routinely incubated at 37 C except those of Pseudomonas fluorescens and Chromobacterium lividum which were incubated at 22 C. For a trial period, 94 strains were tested for their ability to utilize 10 different carbon sources on duplicate plates incubated at 30 and 37 C. Growth at these two temperatures was compared and results recorded as: growth developing at one temperature and not at the other; growth more luxuriant at either temperature; or no difference in growth at either temperature. There was little difference between the results at 37 and 30 C. Repetition of tests showed that 5 percent of the results were non-reproducible. The variability was more pronounced with acetate, maleate and sucrose amongst the substrates and Loefflerella mallei amongst the bacteria. Prior induction of the bacterial enzymes before testing did not reduce variability nor show any other advantage. Analysis of the results by numerical taxonomic methods revealed differences in the groups of bacteria derived from conventional biochemical test results. CSU tests readily provide a large number of taxonomic features with the advantage of a simple standardized testing procedure. (Holoman-Battelle)
W73-12140

A-D AND D-A CONVERTERS FOR HIGH SPEED DATA ACQUISITION APPLICATIONS,
Analogic Corp., Wakefield, Mass.
K. Jackson.
Computer Design, Vol 12, No 4, p 57-64, April 1973. 10 fig.

Descriptors: *Electronic equipment, *Data transmission, Data transmission, Data processing, Design.
Identifiers: *Analog to digital converters, *Digital to analog converters.

New circuitry for analog-to-digital (ADC) and digital-to-analog conversion (DAC) is shown schematically and described. ADC units may be singled-ended multiplexed or differential input multiplexed. High performance differential systems use a balancing cancellation technique known as common mode rejection to reduce the effects of unwanted induced voltages and currents. Submultiplexing may also be used in multiplexed ADC units to reduce settling time, crosstalk, and leakage current. Sample and hold amplifiers may be employed in some converters to increase the bandwidth capability and maintain accuracy of conversion. The development of new circuits and availability of lower cost components and production techniques have reduced the cost and increased the capabilities of ADC and DAC. (Little-Battelle)
W73-12141

CARBON PASTE ELECTRODE WITH A WIDE ANODIC POTENTIAL RANGE,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
J. Lindquist.
Analytical Chemistry, Vol 45, No 6, p 1006-1008, May 1973. 5 fig, 12 ref.

Descriptors: *Fabrication, *Aqueous solutions, *Electrochemistry, Cobalt, Anions, Cations, Anodes, Iodides, Construction, Heavy metals.

Identifiers: *Reproducibility, *Carbon paste electrode, Anodic potential, Cerium, Adenine, Precision, *Ion selective electrodes.

The construction is described of the carbon paste electrode which is being used widely for analytical work in the anodic region. The anodic limit is about plus 1.3 volt in acid aqueous media. In general, an improved carbon paste electrode can be obtained by removing oxygen from graphite powder in a vacuum at high temperature and then blocking the surface of the carbon against further adsorption of oxygen. Voltammograms were run in unstirred iodide, cerium (III), colbalt (II) and adenine solutions. Repeated measurements of the peak current of 0.0005 M Ce (III) in 0.1 M H2S04, where a new surface was prepared in the usual way before every run, gave a relative standard deviation of 1.16 percent. (Holoman-Battelle)
W73-12142

COMPARISON OF THE PRECISION OF NORMAL AND PRECISION SPECTROPHOTOMETRIC TECHNIQUES,
Oregon State Univ., Corvallis. Dept. of Chemistry.
J. D. Ingle, Jr.
Analytical Chemistry, Vol 45, No 6, p 861-868, May 1973. 4 fig, 2 tab, 23 ref.

Descriptors: *Spectrophotometry, *Methodology, Instrumentation, Equations, Chemical analysis, Measurement.
Identifiers: *Precision, Absorbance, Errors.

A general theory for the relative instrumental precision of normal and precision (transmittance ration, trace analysis, and ultimate precision) spectrophotometric absorbance measurements is presented. The theory presented takes into account both reading error and electrical noise (photocurrent shot noise, dark current shot noise, and source flicker noise). Equations are developed which indicate the gain in relative precision expected when a precision spectrophotometric technique is used to expand the transmittance scale in order to reduce the reading error. In some cases, the relative precision is reduced by scale expansion. The precision techniques are shown to be most advantageous for measurement of high absorbance solutions. (Holoman-Battelle)
W73-12143

VIBRIO PARAHAEMOLYTICUS-ISOLATION, IDENTIFICATION, CLASSIFICATION, AND ECOLOGY,
Georgetown Univ., Washington, D.C. Dept. of Biology.
R. R. Colwell, T. E. Lovelace, L. Wan, T. Kaneko, and T. Staley.
Journal of Milk and Food Technology, Vol 36, No 4, p 202-213, April 1973. 15 fig, 3 tab, 33 ref.

Descriptors: *Chesapeake Bay, *Pollutant identification, *Ecology, *Isolation, *Classification, *Methodology, Sediments, Oysters, Clams, Marine bacteria, Ecological distribution, Computer programs, Water analysis, Saline water, Crabs, Mollusks, Bottom sediments, Zooplankton, Systematics, Coasts, Bacteriophage, Gas chromatography, Water sampling, Estuarine environment, Electron microscopy, Cultures, Sewage, Radioactivity techniques, Aquatic soils, Phosphorus radioisotopes, Saline soils, E. coli, Plankton, Pathogenic bacteria.
Identifiers: *Vibrio parahaemolyticus, Numerical taxonomy, Chemotaxonomy, Serology, Blue Crab, Food poisons, Vibrio spp, Fatty acids, Isozyme, Phage typing, Culturing techniques, Organic bases, Polyacrilamide gel electrophoresis, Culture media, Gas liquid chromatography, Enrichment, Gram-negative bacteria, Cytophage, DNA, P-32, Callinectes sapidus.

Vibrio parahaemolyticus was isolated from samples of water, sediment, blue crabs, oysters, and clams collected in several areas of Chesapeake Bay. Numerical taxonomy was used to identify and classify the bacterial isolates. Deoxyribonucleic acid (DNA) base composition, serology, isozyme, gas chromatography, bacteriophage sensitivity, and DNA/DNA reassociation analyses confirmed the identification and classification of V. parahaemolyticus and permitted establishment of genetic relationships of the Chesapeake Bay strains with isolates from victims food poisoning in Japan and from samples taken in geographically diverse areas of the United States. Isolates implicated in recent outbreaks of food poisoning, the first fully documented cases of V. parahaemolyticus food poisoning in the United States, were shown by DNA/DNA reassociation measurements to be closely related to the Japanese and other isolates collected in the United States. Fatty acid profiles of cell derivatives prepared using GLC were useful in diagnosing Vibrio spp., including V. parahaemolyticus and Vibrio cholerae. Bacteriophages isolated from ocean sediments collected off Cape Hatteras were found to be active against V. cholerae and V. parahaemolyticus. Distribution of V. parahaemolyticus appears to be restricted to coastal and estuarine regions. V. parahaemolyticus has been shown to be closely associated with zooplankton and a life cycle for V. parahaemoluticus in Chesapeake Bay is proposed. (Holoman-Battelle)
W73-12144

AUTOMATIC METER READING USING EXISTING TELEPHONE CIRCUITS,
Utilities Telecommunications Council, Washington, D.C.

Journal of the American Water Works Association, Vol 65, No 2, p 99-111, February 1973. 4 fig, 1 tab.

Descriptors: *Telemetry, *Costs, *On-site data collections, *Data processing, Maintenance costs, Operating costs, Installation costs, Automatic control, Data transmission, Cost-benefit analysis, Variable costs, Operation and Maintenance, Estimated costs.
Identifiers: *Automatic meter reading, *Telephone circuits, Data communications terminal, Meter reading access circuit.

Information is provided on the cost factors involved in various possible configurations of telemetered meter reading. Specifically, this is concerned with (1) the reading of meters via telephone circuits, (2) the major cost factors involved in adopting such a system, both telephone company charges and utility costs, (3) some of the factors resulting in ranges of these cost, and (4) some of the other factors that should be considered in a decision concerning automatic meter reading. The system principles are explained for this type of telemetry. Two basic types of automatic meter reading systems are discussed: (1) the telephone company provides the data communications terminal (DCT), the meter reading access circuit (MRAC), and the line coupler or data set at the customer's premises; and (2) the utility instead of the telephone company, owns, installs, and maintains one or more of these elements. Other possible configurations are diagrammed and briefly discussed. (Holoman-Battelle)
W73-12145

ON THE PHOTODECOMPOSITION OF CHLOROPHYLL IN VITRO,
California Univ., Berkeley. Dept. of Nutritional Sciences.
For primary bibliographic entry see Field 05C.
W73-12146

A UNIFIED METHOD FOR THE RECONSTRUCTION OF SAMPLED DATA,
Florida Univ., Gainesville. Dept. of Electrical Engineering.
A. E. Durling, and T. E. Bullock.
IEEE Transactions on Computers, Vol C-22, No 4, p 388-396, April 1973. 5 fig, 2 tab, 10 ref.

Descriptors: *Methodology, *Systems analysis, Data processing, Model studies, Mathematical models, Mathematical studies.
Identifiers: *Sample data, *Data reconstruction, *Digital to analog converters, Polynomial interpolation, Digital filtering.

Many digital systems have need for continuous-type output for oscilloscope display, process control, or hybrid computation. A generalization and unification are presented of the theory of extrapolation and reconstruction of sampled data. This generalization allows implementation of a recursive algorithm or digital filter in conjunction with the continuous data reconstruction. The general procedure is demonstrated for the implementation of an nth-order recursion relation using polynomial or exponential data reconstruction requiring only a single resetting integrator for the general nth-order reconstructor. (Holoman-Battelle)
W73-12147

BEHAVIOR OF THE SILVER, SILVER CHLORIDE ELECTRODE IN CONCENTRATED AQUEOUS SODIUM CHLORIDE,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
H. F. Gibbard, Jr.
Journal of the Electrochemical Society, Vol 120, No 5, p 624-627, May 1973. 2 fig, 3 tab, 31 ref.

Descriptors: *Thermodynamic behavior, *Physicochemical properties, *Sodium chloride, *Aqueous solutions, Solubility, Electrochemistry, Solvents, Electrolytes, X-ray diffraction.
Identifiers: *Solute concentration, Silver electrodes, Ion selective electrodes, *Silver chloride, Solutes.

Electrochemical experiments are reported which confirm the imperfection of the silver/silver chloride electrode in concentrated aqueous sodium chloride. Further experiments and calculations (electrochemical cell measurements and x-ray diffraction) are used to explain this behavior in terms of the formation of a solid solution of silver chloride and sodium chloride. The mole fractions and activities of silver chloride in the solid solutions are calculated from solubility equilibria and are correlated with literature values of the activity coefficients of sodium chloride. (Holoman-Battelle)
W73-12148

THE TAXONOMIC POSITION OF OBESUMBACTERIUM PROTEUS, A COMMON BREWERY CONTAMINANT,
Birmingham Univ. (England). Dept. of Biochemistry.
F. G. Priest, H. J. Somerville, J. A. Cole, and J. S. Hough.
Journal of General Microbiology, Vol 75, No 2, p 295-307, April 1973. 5 fig, 7 tab, 23 ref.

Descriptors: *Systematics, *Cultures, Enteric bacteria, Pollutant identification, Growth rates.
Identifiers: *Obesumbacterium proteus, *Characterization, Dendrograms, Culture media, Hafnia alvei, DNA, Salmonella gallinarum, Biochemistry.

The mole fraction of guanine plus cytosine in the DNA from Obesumbacterium proteus was 48 percent similar to that of Hafnia alevi, Salmonella gallinarum and the RM bacterium. DNA:DNA competition studies indicated that O. proteus strains fall into two groups, both of which could reasona-

ble be included in the family Enterobacteriaceae. The same two groups were apparent from a numerical taxonomic investigation of 19 0. proteus strains which included 16 brewery isolates. The simple matching coefficients (percent S) were calculated from results of 50 biochemical and taxonomic tests, and a dendrogram was constructed. Every O. proteus isolate had the characteristics of the family Enterobacteriaceae. The two subgroups united at 86 percent S, and formed a cluster with Hafnia and Salmonella strains at 72.5 percent S. The difference between Hafnia alvei and O. proteus was almost entirely due to their different vigour rating. Furthermore, in a simulated brewery fermentation, two strains of H. alvei grew in a mixed culture with yeast. This was originally the defining characteristic of the genus Obesumbacterium. Reference to the genus Obesumbacterium should be discontinued, and O. proteus should be placed in the genus Hafnia as Hafnia protea comb. nov. (Little-Battelle)
W73-12149

POTENTIAL PATHOGENS IN THE ENVIRONMENT: ISOLATION, ENUMERATION, AND IDENTIFICATION OF SEVEN GENERA OF INTESTINAL BACTERIA ASSOCIATED WITH SMALL GREEN PET TURTLES,
Oregon State Univ., Corvallis. Dept. of Microbiology.
R. H. McCoy, and R. J. Seidler.
Applied Microbiology, Vol 25, No 4, p 534-538, April 1973. 3 tab, 26 ref.

Descriptors: *Cultures, *Salmonella, Water analysis, Pathogenic bacteria, Separation techniques, Enteric bacteria, Pulbic health, Water pollution sources, Coliforms, Isolation.
Identifiers: *Aeromonas, *Citrobacter, *Enterobacter, *Klebsiella, *Proteus, *Serratia, Feces, Culture media.

Bacteriological analyses were performed on fecal swabs and the aquarium water of 27 individually purchased specimens of the small green pet turtle, Pseudemys scripta elegans. Samples for bacteriological examination, except Klebsiellae, were immediately prepared from the swabs or from dilutions of the saline in which the turtle had been immersed. A second saline sample was removed for examination after 5 days. Klebsiellae were isolated and enumerated after turtles were maintained for several months. Salmonellae were enriched in tetrathionate broth, streaked onto Brilliant Green sulfa agar, picked, and subject to biochemical and serological examination. Enterobacter and Klebsiella were isolated from saline samples by plating onto a modified nitrogen-deficient medium of Hine and Wilson. Aeromonads were isolated and enumerated on peptone-beef extract-glycogen agar. Biochemical examination of all enteric isolates was accomplished by the methods of the Manual of Clinical Microbiology. Representatives of Aeromonas, Citrobacter, Enterobacter, Klebsiella, Proteus, Salmonella, and Serratia were isolated. Enterobacter, Klebsiella, Proteus, Salmonella, and Serratia were isolated. Enterobacter, Klebsiella, and Salmonella were encountered in 20 percent or more of the specimens, whereas Aeromonas was isolated from 63 percent. Klebsiella pneumoniae counts ranged from 1000 to 10,000 per milliliter of aquarium water, whereas Aeromonas routinely exceeded 10,000 per milliliter. Aeromonas cultures from turtles were identical to 7 human isolates in some 29 biochemical tests. (Little-Battelle)
W73-12150

DISTRIBUTION OF THE CLADOCERAN PODON POLYPHEMOIDES IN THE CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
H. F. Bosch, and W. R. Taylor.
Marine Biology, Vol 19, No 2, p 161-171, March 1973. 10 fig, 47 ref.

Descriptors: *Distribution patterns, *Crustaceans, *Life cycles, *Water temperature, *Salinity, *Seasonal reproduction, *Dissolved oxygen, Sampling, Invertebrates, Marine animals, Animal populations, Life history studies, Biorhythms, Sea water, Zooplankton, Standing crops, Estuarine environment, Waterfleas, Chesapeake Bay.
Identifiers: *Podon polyphemoides, Macroinvertebrates, Vertical distribution.

The distribution of the cladoceran Podon polyphemoides (Leuckart) in the Chesapeake Bay estuarine system was determined by a quantitative pump sampling method, and the patterns of abundance were correlated with temperature and salinity distributions. The species was seasonally recurrent, with distinct population maxima in the central portion of the bay. Population densities in excess of 60,000 podonids/cu m have been recorded. The podonids first appeared in the spring in the shallow tributaries, when water temperatures near the bottom reached 6C. The vernal populations disappeared when summer temperatures exceeded 27C, but reappeared in the fall as the water cooled. The species was euryhaline and eurythermal in its distribution, but the greatest concentrations were attained within relatively narrow zones of temperatures between 11 and 26C, and salinities between 0.8 and 1.8 percent. The production of males, sexual females and sexual eggs occurred both in the spring and the fall between the thermal limits of 11 and 17C. (Little-Battelle)
W73-12152

THE USE OF RADIOACTIVE ISOTOPES TO MEASURE THE TRANSFER OF MATERIALS IN AQUATIC FOOD CHAINS,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
R. J. Conover, and V. Francis.
Marine Biology, Vol 18, No 4, p 272-283, February 1973. 5 fig, 4 tab, 29 ref.

Descriptors: *Radioactivity techniques, *Mathematical models, *Food chains, *Kinetics, *Aquatic life, *Transfer, Absorption, Nutrients, Cycling nutrients, Radioisotopes, Feeding rates, Grazing, Respiration, Model studies, Phosphorus, Zooplankton, Phytoplankton, Reviews, Digestion, Mollusks, Equations.
Identifiers: Accuracy, Errors, Elimination, Computer simulation.

Radioisotopes have been misused extensively by ecologists in transfer studies within food chains. Unless it is known that no recycling of isotope has occurred during the experiment, the assumption of linear uptake when in fact the system is not linear, even over short periods, can lead to significant errors in the estimation of ingestion or feeding. If recycling occurs, at least a 3 or 4-compartment hydraulic-type model is necessary to even approximate the complicated kinetics of isotopic transfer in a simple aquatic feeding experiment. It is essential to follow the uptake or loss of an isotope (change in specific activity) as a function of time in at least 1 compartment before deciding on an appropriate model. If experiments are designed so that the maximum number of rate processes are summed or integrated by the animal, the kinetics can be considerably simplified. If the food supply is uniformly labelled, the rate of change of tracer can be used to give a rate of ingestion (grazing). If the predator is labelled with a suitable isotope before starting the experiment, the rate of loss of its isotope burden under different experimental conditions can be used to determine respiration or excretion rates, turnover rates, ingestion, and the size and number of major compartments in the transfer system. (Little-Battelle)
W73-12153

ROLE OF MARINE FUNGI IN THE BIOCHEMISTRY OF THE OCEANS. V. PATTERNS OF CONSTITUTIVE NUTRITIONAL GROWTH RESPONSES,
Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences.
P. L. Sguros, J. Rodrigues, and J. Simms.
Mycologia, Vol 65, No 1, p 161-174, January-February 1973. 1 fig, 4 tab, 20 ref.

Descriptors: *Marine fungi, *Nitrogen, Growth rates, Carbon, Hydrogen ion concentration, Cultures, Nutrients.
Identifiers: *Halosphaeria mediosetigera, *Culcitalna achraspora, *Humicola alopallonella, *Culture media, Ammonium chloride, Potassium nitrate, Potassium nitrite, Ammonium nitrate, Arabinose, Xylose, Ribose, Fructose, Glucose, Mannose, Galactose, Cellobiose, Melibiose, Lactose, Maltose, Sucrose, Raffinose, Rhamnose, Ribitol, Mannitol, Galactitol, Glucuronate, Galacturonate, Gluconate, Glucosamine, N-Acetylglucosamine, Formates, Acetates, Propionates, Butyrates, Caproates, Tartrates, Lactates, Glycerol, 2-Oxoglutarate, Citrates, Succinates, Fumarates, Malates, Glyoxylates, Glycolates, Benzoates, p-Hydroxybenzoate, Dimethoxybenzoate.

Halosphaeria mediosetigera, Culcitalna achraspora, and Humicola alopallonella, cellulolytic marine isolates, were grown in shake flasks in a variety of liquid artificial seawater media designed to demonstrate the value of 38 inorganic and organic compounds as nitrogen (N) sources and 79 organic compounds as carbon (C) sources. Inoculum production and experimental growth was standardized and gravimetrically quantitated. The effects of tris (Hydroxymethyl)aminomethane (THAM) buffer or growth and pH changes in the presence of quantitative variations of the best nitrogen sources were assessed. High C/N source ratios, ranging from 18 to 55, were preferred. While pH remained stable in the presence of THAM, omission of the buffer confirmed the acidogenic nature of NH4 plus salts, pH values of 3.0 or less being recorded. Patterns of C source utilization were compared, emphasizing the effect of sugar derivatives, with those of terrestrial cellulolytic species. In spite of generic differences, marine test organisms responded with remarkable similarity. Generally, all inorganic N sources, urea, valine, leucine, alanine, arginine, glutamate, glutamine, aspartate, asparagine, hypoxanthine, and xanthine promoted significant growth for all three species with glucose as the C source. Cultures proved far more selective in their use of C sources, good growth occurring consistently only in the presence of glucose, fructose, mannose, cellobiose, and xylose. Those organic substrates which acted as good N sources were unable to furnish required C even in the presence of sparking quantities of glucose. Carbohydrate, substituted carbohydrate, and glycoside utilization patterns compared favorably with those of terrestrial species. In the absence of explicit permeability data, it is suggested that these cultures are narrowly saccharolytic, but may be only insignificantly proteolytic, lipolytic, nucleolytic, or ligninolytic. Broader studies are required before adaptive recalcitrance can be used to describe marine fungi in general. (Little-Battelle)
W73-12154

REPORT OF ANALYSES OF WATER SAMPLES SUBMITTED TO SCRIPPS NOVEMBER 1971 FOR THE LAKE MICHIGAN INTERCALIBRATION/INTERCOMPARISON PROGRAM (EIIP),
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Lab.
T. R. Folsom, V. F. Hodge, K. M. Wong, and N. Hansen.
Available from the National Technical Information Service as TID-26199. AT (04-3)-34, N00014-69-A-0200-6011. Report No. TID-26199, April 6, 1972. 6 p, 4 ref.

Descriptors: *Water analysis, *Methodology, Laboratories, Lake Michigan, Water sampling.

Identifiers: *Performance evaluation, *Intercalibration programs, Method evaluation, Cesium radioisotopes, Plutonium radioisotopes, Chemical recovery, Interlaboratory tests, Pu-239, Pu-236, Pu-240, Cs-134, Cs-137.

Water samples were collected at 45 m in Lake Michigan and from the surface near a Chicago water intake station. The latter sample was spiked with radionuclides, including Cs. The pH of both samples was adjusted to 1.0 with dilute NaOH and Cs-133 and Pu-236 spikes were added. The samples were agitated for 15 min, 10 g of pure AMP added to each, and the agitation continued for 15 min more. The AMP precipitates were combined for gamma assay after which they were analyzed for stable Cs, Pu recovery, and Cs-134 and Cs-137. The sample of Lake Michigan water contained 0.058 plus or minus 0.014 pCi (plus or minus 1 gamma)/kg Cs-137, 0.005 pCi/kg Cs-134, and 0.0007 plus or minus 0.003 pCi/kg Pu-239 and Pu-240. In the spiked sample was found 3.66 plus or minus 0.10 pCi/kg Cs-137, 2.76 plus or minus 0.08 pCi/kg Cs-134, and 0.0373 plus or minus Pu-239 and Pu-240. It was concluded that although considerable care was used in these analyses, they should not be used for final evaluation of the relative capabilities of the several laboratories or of the general conditions in Lake Michigan because (a) not enough samples were supplied, (b) the low level reference standards have not been intercompared in all laboratories, and (c) absolute checks of radioactivity of several of these isotopes are still controversial at these very low concentration levels. (Holoman-Battelle)
W73-12156

A NEW SPECIES OF BAETIS (EPHEMEROPTERA) FROM PONDS IN THE CANADIAN ARCTIC, WITH BIOLOGICAL NOTES,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
D. M. Lehmkuhl.
Canadian Entomologist, Vol 105, No 2, p 343-346, February 1973. 8 fig, 1 tab, 9 ref.

Descriptors: *Systematics, *Mayflies, Aquatic insects, Invertebrates, Speciation, Classification, Canada.
Identifiers: *Baetis bundyi, Macroinvertebrates.

Baetis bundyi new species is described from nymphs which were collected from tundra ponds in the central Canadian arctic (62.45 N., 94.27 W). Based on measurements of a series of nymphs, the eggs must hatch in early July and adults emerge in August. A table is presented for separating this species from other known arctic Baetis. (Little-Battelle)
W73-12157

INITIAL STUDIES ON A METHOD OF ALGAL ASSAY FOR NUTRIENT PARAMETERS IN WATER,
Saskatchewan Univ., Regina. Dept. of Biology.
D. R. Cullimore, and A. McCann.
J Fish Res Board Can. Vol 29, No 2, p 195-198, 1972. Illus.
Identifiers: *Algal assay, *Bioassay, Carbon, Filtration, Nitrogen, *Nutrients, Phosphorus, Readings, Reflectometric readings.

A bioassay technique was outlined for estimating the impact of supplementation of the nutrients C, N, and P on algal growth. One of the main problems was the monitoring of algal growth using lengthy techniques of chlorophyll extraction with acetone. An alternative system involving filtration and reflectometric readings at 600 nm is described and found to be satisfactory when 5 readings were taken per filtered disk. -Copyright 1972, Biological Abstracts, Inc.
W73-12158

ENVIRONMENTAL STATEMENT, RIO BLANCO GAS STIMULATION PROJECT, RIO BLANCO COUNTY, COLORADO.
Atomic Energy Commission, Washington, D.C.

Available from NTIS, Springfield, Va., as WASH-1519 (D). Report No. WASH-1519, April 1972. 170p, 38 fig, 22 tab, 65 ref, 6 append.

Descriptors: *Nuclear explosions, *Underground, *Natural gas, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Beneficial use, Cost-benefit analysis, Natural resources.
Identifiers: Atomic Energy Commission, *Gas Buggy, *Plowshare Program. Environmental Impact Statements.

This environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed Rio Blanco Gas Stimulation Project in Rio Blanco County, Colorado. Environmental impacts are assessed, consideration given to alternatives, and an environmental benefit-cost summary compiled. Some environmental factors considered include hydrology (surface water and ground water), ecology, radioactivity release, seismology (including ground motion), geology, mineral resources, chemical effects, waste management, and results of the flaring operation. The conclusion is that the proposed project is the best available alternative, that the benefits of the proposed action outweigh its probable environmental costs, and that the project should be implemented. (Houser-ORNL)
W73-12258

ACTIVATION ANALYSIS OF MERCURY IN BIOLOGICAL SAMPLES,
Technische Hochschule, Munich (West Germany). Institut fuer Radiochemie.
J. I. Kim, and S. R. Sunoko.
Available from NTIS, Springfield, Va., as CONF-721010-39; $4.00 in paper copy; $1.45 microfiche. Report CONF-721010-39. (1972), 12p, 1 fig, 8 tab, 16 ref.

Descriptors: *Mercury, *Bioindicators, *Neutron activation analysis, *Analytical techniques, Radioactivity techniques, Separation techniques, Public health, Food chains, Path of pollutants.

Mercury was separated before evaluation of its gamma spectrum to avoid interference from Na, K, P, and halogens. The Hg was dissolved by refluxing the samples in concentrated nitric acid and was separated by deposition from 0.5 to 1.5 molar acid on copper sieving or granules. Techniques are detailed for handling uring, tuna fish, and kale samples. The sensitivity was about 0.2 ppb for urine; about 0.01 ppm for tuna fish and kale. (Bopp-ORNL)
W73-12260

INVESTIGATIONS OF THE FATE OF CERTAIN PESTICIDES UNDER BIOTIC AND ABIOTIC CONDITIONS USING TRACER TECHNIQUES,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
For primary bibliographic entry see Field 05B.
W73-12261

A SIMPLE METHOD FOR THE ACTIVATION ANALYSIS OF MERCURY IN FISH: MERCURY CONTENT IN VENEZUELAN CANNED TUNA,
Instituto Venezolano de Investigaciones Cientificas, Caracas.
J. A. Lubkowitz, F. Montoloy, and M. Heurtebise.
In: Radiotracer Studies of Chemical Residues in Food and Agriculture, International Atomic Energy Agency, Vienna, p 77-80, 1972, Vienna, 1 fig, 1 tab, 11 ref.

Descriptors: *Mercury, *Food chains, *Marine fish, *Neutron activation analysis, Radioactivity techniques, Analytical techniques, Radiochemical analysis, Separation techniques, Public health.

Mercury in canned tuna (0.071-1.33 ppm) and sardines (0.009 ppm) was determined by measurement of Hg197 (73 kev) gamma radiation with a 'thin' NaI (tl) crystal coupled to a pulse-height analyser. Samples irradiated in quartz ampoules were allowed to decay for 2-3 days, frozen in liquid nitrogen and wrapped with a thin polyethylene sheet, broken, and transferred to a flask containing Hg carrier. After digestion in an acid mixture at 90-95 C, the mixture was neutralized and the Hg absorbed from solution on iodinated ion exchange resin for counting. About 40 samples/day were processed. (Bopp-ORNL)
W73-12267

BAYESIAN ESTIMATION AND DESIGN OF EXPERIMENTS FOR GROWTH RATES, WITH APPLICATIONS TO MEASURING WATER QUALITY,
American Cyanamid Co., Norwalk, Conn.
D. W. Behnken, and D. G. Watts.
In: Proceedings (Vol. 1), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 2-15, (1972) 2 fig, 3 tab, 4 ref.

Descriptors: *Water quality, *Monitoring, Lakes, *Growth rates, *Algae, *Design, Measurement, Distribution, Optimization, Equations, Mathematical models, Systems analysis.
Identifiers: *Bayesian estimation.

One procedure for monitoring the quality of a lake is to inject a sample of lake water with an algal culture and measure the growth rate of the algae. An oligotrophic lake should induce a low rate of growth, a eutrophic lake a high one. It is assumed that over the experimental period the algal growth rate follows an exponential law, that is the density of algae is small so that important nutrients are not depleted. It is further assumed that the algal counts are well described by a Poisson distribution. A Bayesian approach is presented to derive an expression for the best estimate of the growth rate parameter and a distribution which describes the relative plausibility of different values. Considered also is the related design problem, that is the problem of choosing the sampling times and the volumes at each time in order to provide an estimate of the growth rate with the greatest precision or sharpest posterior distribution. The results are illustrated with reference to a particular example using a culture of algal, Selenestrum capricornutum (PAAP strain). (See also W73-12269) (Bell-Cornell)
W73-12270

DESIGN OF USAF WATER QUALITY MONITORING PROGRAMS,
Air Force Adademy, Colo. Dept. of Civil Engineering.
S. E. Schultz.
Available from NTIS, Springfield, Va 22151 as AD-756 504 Price $3.00 printed copy; $1.45 microfiche. Air Force Systems Command, Frank J. Seiler Research Laboratory Report SRL-TR-72-0018, August 1972. 189 p, 12 fig, 32 tab, 31 ref, 8 append.

Descriptors: *Water quality, *Networks, *Data collections, *Water pollution control, Military reservations, Water analysis, Sampling, Chemical analysis, Surface waters, Groundwater, Data processing, Data storage and retrieval, Computer programs.

A study was made to evaluate and assist in the future implementation of water quality monitoring programs at Air Force installations. Such a network of Air Force monitoring stations is necessary

for (1) the assessment of compliance with federal, state and local water quality standards, (2) the evaluation of the effectiveness of water pollution abatement measures, and (3) the detection of potential water quality problems requiring corrective action before a crisis develops. In addition to accomplishing these minimum Air Force responsibilities an Air Force wide water quality monitoring program would provide for justification for Air Force water pollution abatement facilities; detection of long-term trends and overall changes in water quality; the most appropriate areas for research studies; and support of nationwide water quality surveillance network and local area pollution abatement programs. (Woodard-USGS)
W73-12317

5B. Sources of Pollution

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Bradley Univ., Peoria, Ill. Dept. of Biology.
B. J. Mathis, and N. R. Kevern.
Available from the National Technical Information Service as PB-221 993, $3.00 in paper copy, $1.45 in microfiche. Institute of Water Research, Michigan State University, East Lansing, Project Completion Report, June 1973. 25 p, 6 fig, 5 tab, 21 ref. OWRR A-062-MICH (1). 14-31-0001-3522.

Descriptors: *Mercury, *Cadmium, *Lead, *Water pollution, *Heavy metals, *Biota, Aquatic environment, Limnology, Food chain, Lenthic Environment, Lakes.
Identifiers: *Thallium, Atomic absorption spectrophotometry.

The concentrations were studied of mercury, cadmium, lead and thallium in various components of a eutrophic lake. Five species of fishes, two species of aquatic macrophytes, zooplankton, migratory goose feces, water and sediments were analyzed for the four metals. The study revealed that the bottom sediments act as a 'sink' for all four metals. With the exception of mercury, highest concentrations were found in bottom sediments. Mercury was detected in fishes and sediments only, while thallium was detected only in bottom sediments. Largemouth bass, one of the top carnivores of the lake, exhibited a positive correlation between length and weight versus mercury concentrations in axial musculature. The feces of migratory waterfowl had high conentrations of cadmium and lead. In view of the large numbers of waterfowl using the lake each year, and the large quantity of feces deposited within the drainage basin, it is suggested that this avenue may be one of the major sources of contamination for these two metals and that fallout from airborne particulate matter is secondary. Residual concentrations of the four metals in soil of the drainage basin were not determined. The primary source of mercury and thallium for the lake is presumed to be from fallout of airborne particulate matter.
W73-11707

KINETICS OF MICROBIALLY MEDIATED METHYLATION OF MERCURY IN AEROBIC AND ANAEROBIC AQUATIC ENVIRONMENTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
J. J. Bisogni, Jr., and A. W. Lawrence.
Available from the National Technical Information Service as PB-222 025, $6.00 in paper copy, $1.45 in microfiche. Technical Report 63, May 1973. 180 p, 23 fig, 31 tab, 123 ref. OWRR-A-038-NY (1). 14-31-0001-3532-3832.

Descriptors: *Mercury, *Microorganisms, *Kinetics, *Aquatic environment, Water pollution sources, Analytical techniques, Temperature, Heavy metals.
Identifiers: Methylation.

The microbial transformation of inorganic mercury to organic mercury (mono-methyl- and dimethyl-mercury) was studied with regard to the effects of the following: (1) redox potential, (2) inorganic mercury concentration, (3) temperature, (4) microbial activity, and (5) sulfide concentration. A kinetic model to describe the rate of methylation included the following parameters: (1) coefficient indicating relative microbial activity, (2) a coefficient indicating biochemical availability of the inorganic mercury, (3) a parameter determined by the system redox potential, and (4) inorganic mercury concentration. The kinetic studies showed that: (1) monomethylmercury is the predominant product of methylation of mercury (near neutral pH), (2) the rate of methylation was higher in aerobic systems than in anaerobic systems for a given inorganic mercury concentration and microbial growth rate, (3) higher microbial growth rates result in higher methylation at a given inorganic mercury conentration for both aerobic and anaerobic systems, (4) methylation rates could be hindered by the addition of sulfide to some anaerobic systems, (5) temperature affects methylation rates only as it affects the microbial activity of the methylating organisms, and (6) large amounts of metallic mercury were stripped from the aqueous phase in all reactors. The kinetic model was extended for application to natural aquatic benthic regions, and biological waste water treatment schemes, and was used to evaluate proposed decontamination schemes for mercury polluted aquatic environments.
W73-11711

CATION TRANSPORT IN SOILS AND FACTORS AFFECTING SOIL CARBONATE SOLUBILITY,
Utah State Univ., Logan.
J. J. Jurinak, S. H. Lai, and J. J. Hassett.
Copy available from GPO Sup Doc as EP1.23/2:1, 73-235, $1.25, microfiche from NTIS as PB-222 006, $1.45. Environmental Protection Technology Series Report No EPA-R2-73-235, May 1973. 87 p 23 fig, 4 tab, 31 ref, append. EPA Project 13030 FDJ.

Descriptors: *Ion transport, *Calcium carbonate, Leaching, Cation exchange, Irrigation, Return flow, Chemical precipitation, Hardness (Water), Solutes, Solubility.
Identifiers: *Solute transport, *Carbonate solubility, Miscible displacement, Carbonate saturometer.

A predictive model of cation transport in soils undergoing miscible displacement was developed and tested. A mass balance equation was formulated to include a general nonlinear cation exchange function. The model was applied to the transport of cations through an exchanger using five types of exchange functions. The model was further tested by conducting soil column studies which involved both homovalent and heterovalent exchange. Good agreement between experimental and predicted data was obtained. Laboratory studies were also conducted to assess the affect of Mg+2 ion on the solubility of calcareous materials. Solubility was found to vary with the surface area and mineralogy of the carbonate material, and the degree of saturation of the water with respect to a given carbonate mineral. In waters unsaturated with respect to calcite, Mg+2 generally increased the solubility of calcite. The presence of Mg+2 decreased the solubility of dolomite in waters which were near saturation with respect to dolomite. (EPA)
W73-11714

FEEDLOT WASTE UTILIZED EFFICIENTLY BY ANIMALS.
Oklahoma State Univ., Stillwater.

Agriculture at OSU, Summer, 1972, 1 p.

Descriptors: *Farm wastes, Sheep, *Feed lots, *Proteins.
Identifiers: *Digestibility.

Feedlot dry wastes from an open feedlot were fed to sheep. Though the wastes were high in digestible protein and nutrients, a potential hazard is the entry of toxic materials into the human food chain. These first tests were limited and need to be repeated more thoroughly before any recommendations will be available. (Lee-East Central)
W73-11762

DAIRY WASTE PONDS EFFECTIVELY SELF--SEALING,
Agricultural Research Service, Riverside Calif. Soil and Water Conservation Research Div.
S. Davis, W. Fairbank, and H. Weisheit.
Paper presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper no 72-222, 10 p, 2 tab, 1 fig, 10 ref.

Descriptors: Groundwater pollution, Farm wastes, *Infiltration rates, *Farm lagoons, Sewage ponds, *Sealing, Cattle, Dairy Industry.

Infiltration rates of contaminated water from manure ponds are discussed. Infiltration rates of a dairy waste pond were measured with irrigation water before manure water was applied. Infiltration decreased from 48 inches per day with clean water to 0.2 inches per day with manure water after 4 months. (Lee-East Central)
W73-11764

WHY NITRATES IN WATER SUPPLIES,
G. E. Smith.
Hoard's Dairyman, Vol 110, No 18, p 1048-1049, September 25, 1965. 3 fig.

Descriptors: *Nitrates, Feed lots, Fertilizers, *Farm wastes, Missouri, Water supply, Water wells, Water pollution sources.
Identifiers: *Water contamination.

Studies show that 75% of Missouri's water is contaminated by nitrates, primarily from feedlots. Shallow wells are most affected, but deep ones can be if improperly cased. To solve the problem, new properly encased wells should be dug some distance from feedlots. (Marquard-East Central)
W73-11765

WINTER AND SUMMER SHELTER FOR BEEF CATTLE IN LOUISIANA,
Louisiana State Univ., Alexandria. Dean Lee Agricultural Center.
J. Pontif, W. A. Nipper, A. F. Loyacano, and H. J. Braud.
Paper presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper No 72-425, 23 p, 6 fig, 7 tab, 6 ref.

Descriptors: *Feed lots, *Farm wastes, *Louisiana, Windbreaks, *Climates, Cattle, Feedlots.
Identifiers: Shelters, Fans.

The purpose was to learn what advantage in feedlot performance of fattening cattle could be attributed to winter shelter and summer shade and fans under Louisiana feedlot conditions. Experimental procedures are detailed. Findings are reported in figures and tables. It was found that (1) winter roofs did not improve gain, (2) windbreaks were detrimental to daily gains because they prevented drying of wet floors, (3) fans did not increase gains, and (4) summer shades were most beneficial in promoting gains. (Marquard-East Central)
W73-11768

HOW WEATHER AFFECTS FEEDLOT PERFORMANCE.

Feedlot Management, Vol 13, No 2, p 38-39. February, 1971.

Descriptors: *Mud, *Rain, *Winds, *Feedlots, Farm wastes, *Weather effects, Winter, Productivity.
Identifiers: Shelter.

Studies were made of weather factors associated with winter as possible causes of reduced feedlot performance. Tests were performed under artificially produced conditions. Mud was the most serious cause of reduced production. Rate of gain was reduced and the amount of feed required increased. Artificial areas are described and resulting data are given. (Fomby-East Central)
W73-11772

MATHEMATICAL SIMULATION OF ENERGY METABOLISM IN BEEF ANIMALS,
Oklahoma State Univ., Stillwater.
M. D. Paine, J. A. Witz, A. F. Butchbaker, C. M. Bacon, and J. E. McCroskey.
Paper presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper No. 72-510, 25 p, 8 fig, 2 tab, 26 ref.

Descriptors: *Feed lots, *Mathematical models, *Energy, Systems analysis, Farm wastes, Cattle, *Animal metabolism.
Identifiers: Bioenergetics.

A mathematical model is presented that determines the amount of energy gained and lost in a feedlot situation by using a systems approach. Validation of the complete model indicated that more experience with model parameters will be necessary. However, the model did show potential for making valid estimates of animal growth and feed consumption. Possible applications of the model are demonstrated and discussed. Figures and tables list feedlot variables considered and predictions vs. experimental data in determining the validity of this mathematical model. (Marquard-East Central)
W73-11779

NITRATES DANGER FOR HUMANS, TOO,
J. E. Grundman.
Missouri Ruralist, p 24-25, February 27, 1965.

Descriptors: Feed lots, *Water wells, *Nitrates, *Farm wastes, *Missouri, Water pollution sources.
Identifiers: Nitrate cyanosis.

Nitrate contamination of well water in Missouri has been recognized in recent years. Although sampling is incomplete and data not totally conclusive, nitrate pollution appears to be closely linked with proximity to feed lots and livestock wastes, silo drainage, manure piles, and septic tanks. Infants not yet consuming solid foods are subject to nitrate cyanosis from the intake of high-nitrate water in feedlot areas. A high nitrate content also accounts for a number of maladies in livestock. Suggestions for combating nitrate pollution are given. (Anderson-East Central)
W73-11781

A SURVEY OF DISPERSION COEFFICIENTS FOR ESTIMATING POLLUTANT TRANSPORT,
Grumman Aerospace Corp., Bethpage, N. Y.
K. Keen.
Available from NTIS Springfield, Va 22151 as AD-754 010, Price $3.00 printed copy; $1.45 microfiche. Research Department Memorandum RM-562, December 1972. 35 p, 17 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Waste assimilative capacity, Mathematical studies, Dispersion, Turbulence, Waste treatment, Design criteria, Rivers, Estuaries, Analytical techniques, Evaluation, Reviews.

Pollutants discharged into any body of water are distributed primarily by advection and turbulent diffusion. To estimate the magnitude of this latter mechanism, a determination of a term known as the turbulent dispersion coefficient is necessary. A survey is presented of some of the more recent (through mid-1971) attempts made to define this coefficient for coastal regions, rivers, and estuaries. The effluent from a plant may discharge into a river, bay, or coastal region, in each of which a different mixing process is taking place. Thus, the importance of knowing the dispersion coefficient of the receiving waters can immediately be interpreted in terms of the dollars associated with the complexity of the treatment facility. (Woodard-USGS)
W73-11814

FIELD STUDIES ON SALT LEACHING IN A HIGHLY SALINE SODIC SOIL,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 02G.
W73-11835

OIL AND ICE IN THE ARCTIC OCEAN: POSSIBLE LARGE-SCALE INTERACTIONS,
Geological Survey, Tacoma, Wash. Ice Dynamics Project.
W. J. Campbell, and S. Martin.
Science, Vol 181, No 4094, p 56-58, July 6, 1973. 1 fig, 1 tab, 18 ref.

Descriptors: *Oil spills, *Sea ice, *Arctic, *Albedo, *Climatology, Water pollution effects, Disasters.

The diffusion and transport mechanisms generated by the pack ice dynamics of the Beaufort Sea, combined with the slow rate of biodegradation of oil under Arctic conditions, would diffuse an oil spill over the sea and eventually deposit the oil on the ice surface, where it would lower the natural albedo over a large area. The Arctic pack ice covers an area of about 10 million sq km with an average thickness between 3 and 4 m. This thin veneer of ice is extremely important in determining the heat exchange between the ocean and atmosphere. If the ice cover were removed from the Arctic, it might not reform. Modification of the snow or ice surface is the most effective means of large-scale ice removal. (Knapp-USGS)
W73-11839

ENVIRONMENTAL RESEARCH LABORATORIES IN THE FEDERAL GOVERNMENT--AN INVENTORY, VOLUMES I AND II,
Syracuse Univ. Research Corp., N. Y. Policy Inst.
For primary bibliographic entry see Field 09C.
W73-11845

SILICON AND THE ECOLOGY OF MARINE PLANKTON DIATOMS. II. SILICATE-UPTAKE KINETICS IN FIVE DIATOM SPECIES,
Oslo Univ. (Norway). Inst. of Marine Biology; and Oslo Univ. (Norway). Dept. of Limnology.
E. Paasche.
Marine Biology, Vol 19, No 3, p 262-269, April 1973. 10 fig, 2 tab, 22 ref.

Descriptors: *Diatoms, *Silicates, *Absorption, *Kinetics, *Cultures, Phytoplankton, Marine algae, Chrysophyta, Regression analysis, Limiting factors.
Identifiers: *Substrate utilization, Skeletonema costatum, Thalassiosira spp., Ditylum brightwelli, Licomorpha, Culture media, Algal physiology, Algal growth.

The variation of the rate of silicate uptake with varying silicate concentration in the medium was investigated in short-term experiments with the following marine diatom species: Skeletonema costatum, Thalassiosira pseudonana, Thalassiosira decipiens, Ditylum brightwellii, and Licmorphora sp. The uptake conformed to Michaelis-Menten kinetics only after a correction had been made for reactive silicate that apparently could not be utilized by the diatoms. The magnitude of this correction was in the range of 0.3 to 1.3 microgram-at Si/l. Mean values of the half-saturation constant of silicate uptake were calculated for the different species. The lowest value was found in Skeletonema costatum (0.80 microgram-at Si/l) and the highest in Thalassiosira decipiens (3.37 microgram-at Si/l). Growth limitation by low silicate concentrations could be a cause of species succession in marine plankton-diatom blooms. (Holoman-Battelle)
W73-11863

POPULATION AND POLLUTION IN THE UNITED STATES,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W73-11869

DISTRIBUTION OF ORGANICS FROM SALMON DECOMPOSITION,
Alaska Univ., College. Inst. of Marine Science.
J. Goering, and D. Brickell.
Available from the National Technical Information Service as PB-222 017, $3.00 in paper copy, $1.45 in microfiche. Alaska Institute of Water Resources, Publication No IWR-34, December 1972, 9 p, 3 ref, append. OWRR A-032-ALAS (1). 14-31-0001-3203.

Descriptors: *Water pollution effects, *Pollutant identification, *Nitrates, *Nitrogen compounds, *Salmon, Marine fish, Estuaries, *Alaska, Water pollution, Food processing industry, Industrial wastes, *Detritus, Decomposing organic matter.
Identifiers: Iliuluik Bay (Alaska).

Cold water ecosystems, such as occur along most of coastal Alaska, are thought to be particularly susceptible to major alterations in biological community structure by seafood processing wastes. The results of a study in Iliuliuk Bay, Alaska, which receives seafood processing wastes, indicate that NH+4 increases drastically in the water while it resides in the bay. A sharp decline in O2 with depth along with the high levels of NH+4 suggests that organic matter accumulating on the bottom is rapidly decomposed. NH+4 levels increase and O2 decreases as the seafood processsing plant is approached from seaward. The chemical dynamics of salmon carcass decomposition in a natural system, i.e., a salmon spawning stream and its associated estuary in southeastern Alaska have also been examined for two years using NH+4 and organic -N as indices of decomposition. Following spawning and death, the majority of the salmon carcasses drifted into the estuary and were deposited on the bottom, closely imitating the situation found at seafood processing plants. The concentrations of NH+4-N and dissolved organic -N in the stream and estuary were relatively low and unvariable before initiation of spawning. During spawning, NH+4-N and organic -N increased and as the number of salmon carcasses increased, the downstream increase in NH+4-N and organic -N became greater. Large increases in organic -N were also noted in the estuary, but NH+4-N remained nearly uniform and did not reflect the immediate effect of carcass decomposition.
W73-11887

APPLICATIONS OF A DERIVED FORMULA FOR THE DISCHARGE OF RADIOACTIVE LIQUID WASTES,
Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

For primary bibliographic entry see Field 05C.
W73-11901

REPORT ON RELEASES OF RADIOACTIVITY IN EFFLUENTS FROM NUCLEAR POWER PLANTS FOR 1971.
Directorate of Regulatory Operations (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Rpt. No. WASH-1198 (1971); $4.00 per copy, $1.45 microfiche. Report No. WASH-1198 (1971). 12 p, 4 tab.

Descriptors: *Effluents, *Nuclear powerplants, *Measurement, *Assay, Data collections, Administrative agencies, Regulation, Radiation, Radioisotopes, Standards, Operations, Toxicity, Safety, Public health, Water pollution, Water pollution sources, Liquid wastes, Gases, Tritium.
Identifiers: Atomic Energy Commission.

A tabulation of radioactivity released in effluents from nuclear power plants for calendar year 1971 is presented. The radioactivity in effluents from licensed nuclear power plants has generally been low in comparison with the permissible limits set forth in the Atomic Energy Commission's Part 20 of Title 10, Chapter 1, Code of Federal Regulations, 'Standards for Protection Against Radiation.' (Houser-ORNL)
W73-11905

ENVIRONMENTAL MONITORING IN THE VICINITY OF THE LOS ALAMOS SCIENTIFIC LABORATORY - CALENDAR YEAR 1972.
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 05A.
W73-11909

SOME FEATURES OF THE IMPACT OF A FUSION REACTOR POWER PLANT ON THE ENVIRONMENT,
Argonne National Lab., Ill.
J. E. Draley, and S. Greenberg.
Available from NTIS, Springfield, Va., as CONF-721111-22; $4.00 per copy, $1.45 microfiche. Report CONF-721111-22, Nov 1972. 38 p, 3 fig, 4 tab, 25 ref.

Descriptors: *Tritium, *Nuclear powerplants, *Environmental effects, *Nuclear wastes, Path of pollutants, Feasibility studies, Radioactivity effects, Effluents, Accidents, Hazards, Damages, Forecasting, Systems analysis, Public health.
Identifiers: Fusion powerplants.

As compared with fission plants, a reference fusion plant (470 megawatts electric) (1) requires no fuel-reprocessing plant, (2) accumulates greater radioactivity in structural materials, and (3) will likewise have very low tritium leakage. It is assumed that the use of an unspecified technique (such as a hot diffuser wall) will keep the tritium concentration as low as 1 ppm in the lithium heat-transfer fluid in the primary circuit. The major tritium release (about 2.6 Curies/day) will occur in steam blowdown. This compares with 11 Curies/day for Pressurized Water Reactors and 0.13 Curie/day for Boiling Water Reactors, both augmented by 34 Curies/day at fuel reprocessing plants. The maximum credible accident will release about 7 million Curies over a 3-day period, giving a maximum dose at the site boundary of 45 mrem for average meteorologic conditions, ranging to 13 rems for unfavorable conditions. (Bopp-ORNL)
W73-11910

THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, NEW SOUTH WALES,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
M. S. Giles.
Available from NTIS, Springfield, Va., as AAEC/TM 616; $4.00 in paper copy, $1.45 microfiche. Report AAEC/TM 616, October 1972. 19 p, 7 fig, 2 tab, 15 ref.

Descriptors: *Estuarine environment, *Radioecology, *Phosphorus radioisotopes, *Phytoplankton, Zooplankton, Nuclear wastes, Food chains, Feasibility studies, Path of pollutants, Saline water intrusion, Environmental effects, Turnovers, Storm runoff, Stratification, Mixing, Biomass, Salinity, Chlorophyll, Australia, Tritium.

It appears feasible to define critical radionuclide pathways for human exposure using tracer experiments. As an example a study was conducted in a small estuary for which the biomass was limited by rapid environmental changes (freshwater runoff, marine water incurion, anaerobic conditions in the deeper layers in summer). Macrophytic algae were absent. Added soluble P32 was taken up by phytoplankton with a turnover time of about 2 hr. Flushing of the phytoplankton by the tides caused loss of at least 90% of the P32. Loss of tritiated water tracer was somewhat more rapid. Zooplankton were not flushed by the tides and retained part of the P32. (Bopp-ORNL)
W73-11912

THE POTENTIAL RADIOLOGICAL IMPLICATIONS OF NUCLEAR FACILITIES IN THE UPPER MISSISSIPPI RIVER BASIN IN THE YEAR 2000.
Division of Reactor Development and Technology (AEC), Washington, D.C.

Available from Supt. of Documents, Govt. Printing Office, Washington, D.C. Report WASH-1209, January 1973. 244 p, 122 fig, 59 tab, 159 ref, 5 append.

Descriptors: *Nuclear powerplants, *Effluents, *Radioisotopes, *Air pollution, *Water pollution, *Water pollution sources, *Soil contamination, Forecasting, Public health, Assay, Food chains, Monitoring, Mississippi River, River basins, Meteorology, Hydrology, Topography, Population, Distribution patterns.
Identifiers: *Mississippi River Basin.

This study considers the radiation potentially received by the population of the upper Mississippi River Basin study area which might result from the operation of nuclear power and fuel reprocessing facilities in the yr 2000. The results of the study based on the selected radioactive-waste-treatment systems showed that, on the average throughout the region, the potential radiation an average individual could receive in the year 2000 would be increased by roughly 0.2 millirem/year because of the presence of nuclear facilities. (Houser-ORNL)
W73-11918

DETERMINATION OF THE DIFFUSION COEFFICIENT OF RADIOELEMENTS IN THE RHONE SEDIMENTS,
National Inst. of Radiological Sciences, Chiba (Japan).
M. Ijuin, P. Picat, A. Saas, and A. Grauby.
Health Physics, Vol 24, p 665-672, June 1973. 12 fig, 2 tab, 15 ref.

Descriptors: *Nuclear wastes, *Path of pollutants, *Sediments, *Absorption, Strontium radioisotopes, Zinc radioisotopes, Cobalt radioisotopes, Diffusion, Penetration, Ion transport, Rivers, Water pollution, Cores, Dating.
Identifiers: Cerium radioisotopes, Cesium radioisotopes, Manganese radioisotopes.

Sediments that were characterized by analysis for 9 major metals and 5 trace metals were contacted at the surface with radionuclide solutions for 11-147 days. Most of the Ce141, Co60, Cs137, and Zn65 was sorbed near the surface; but at lower depth the depth-concentration relation followed Fick's second law of diffusion. Stirring the solution affected the surface sorption but not the diffusion coefficient. The high Ca content of the sediments is believed to decrease the surface sorption of Sr85 such that Fick's law applied over the entire core. Surface sorption was also absent for Mn54 after 39 days but not after 147 days. Analysis of sediment cores for radionuclides with low diffusion coefficients (D) (such as Sr85 for which D is about 0.021 sq. cm/day) may prove useful for dating sediments. (Bopp-ORNL)
W73-11921

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT - JULY-DECEMBER, 1971,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05A.
W73-11923

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1972,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05A.
W73-11924

EFFECT OF DIVERSION OF DOMESTIC WASTE WATERS ON PHOSPHORUS CONTENT AND EUTROPHICATION OF THE MADISON LAKES,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05C.
W73-11946

PRESERVING THE GREAT LAKES,
Resources Development Consultants, Inc. Fort Collins, Colo.
G. J. Kelnhofer, Jr.
Available from the National Technical Information Service as PB-211 442, $4.85 in paper copy, $0.95 in microfiche. National Water Commission, Arlington, Virginia, Report NWC-SB-72-052, May 1972. 73 p, 50 ref. NWC 72-010.

Descriptors: *Water quality control, *Great Lakes, Environment, Institutions, Model studies, Pollution abatement, Eutrophication, Planning, Coordination, Management, Federal government, Water pollution sources, Economics, State jurisdiction, Social aspects, Programs, Water level fluctuations, Diversion losses, Fisheries, Administration, Conferences, International commission, Water quality standards, Waste water treatment, Analytical techniques, Water policy, International Joint Commission, Political constraints.
Identifiers: Institutional design, Multipurpose uses, Limnological systems analysis, Great Lakes Basin Commission.

The Great Lakes' present environmental conditions are reviewed and contributing factors assessed. Probably the most vital missing ingredient about the severity of damage being inflicted and about efficacy of the remedies employed is knowledge of the Lakes' function. More urgent than data gathering now is need of analytical tools to make effective use of the data already acquired. Data should be organized and systematized into a model or models simulating the Lakes' processes and illustrating their function. It is recommended that Federal funds for research be allocated to the Great Lakes Basin Commission for at least five years to develop methods for analyzing the impact of alternative pollution abatement measures. Before information about what could be done or should be done can affect performance, there must be a means for using the information. This implies a management organization or organizations with capability of utilizing such information to make decisions resulting in an improved en-

vironment. The institutional arrangements should include a systemwide organization and five lake organizations with each lake represented by its own council. Systemwide, the Great Lakes council (or board) should serve as integrating body for the councils. (Jones-Wisconsin)
W73-11955

NUTRIENT SOURCES FOR LAKE MENDOTA--1972,
Wisconsin Univ., Madison. Water Chemistry Program.
W. C. Sonzogni, and G. F. Lee.
Report (Undated). 49 p. 2 fig, 15 tab, 55 ref. (1972) EPA R-801360.

Descriptors: *Water quality control, *Eutrophication, *Nutrients, *Lakes, Wisconsin, Land use, Base flow, Tributaries, Agricultural runoff, Nitrogen, Phosphorus, Denitrification, Runoff, Measurement, Urban runoff, Precipitation (Atmospheric), Nitrogen fixation, Marshes, Trees, Waste water (Pollution), Sewage treatment, Fallout, Leaves, Erosion, Industrial wastes, Domestic wastes, Urbanization.
Identifiers: Nutrient sources, *Lake Mendota (Wis).

To evaluate the effects of changes in population, watershed land use, and recent diversion of sewage effluents which had entered the tributaries of Lake Mendota, Wisconsin, the total amounts of nutrients entering the lake and quantitative information on the forms and sources of nutrients are updated from 1966 estimates. Contributions from base flow, rural runoff, urban drainage (including phosphorus contribution from leaves, seeds from trees, and flowers) and industrial drainage are estimated. A comparison of 1972 estimates to those of 1966 for atmospheric precipitation and dry fallout indicates that they are significantly higher than originally published. Control of these diffuse nutrient sources at site of origin is suggested for agricultural and stormwater runoff. The Dane County Planning Commission acted to prevent urban development of Lake Mendota's watershed because of the fear that conversion of farm land to urban usage would increase the nutrient flux to the lake. A proposed law would prevent winter spreading of manure from dairy operations and draining of marshland for agricultural or urban use. The real significance of the various nutrient forms which are or can be available for aquatic growth, i.e., particulate, organic, etc., is the basis for designing meaningful eutrophication control programs. (Auen-Wisconsin)
W73-11960

SIMULATION OF HYDROLOGIC AND CHEMICAL-QUALITY VARIATIONS IN AN IRRIGATED STREAM-AQUIFER SYSTEM--A PRELIMINARY REPORT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02A.
W73-12024

POTENTIAL FOR GROUND WATER POLLUTION FROM THE LAND DISPOSAL OF SOLID WASTES,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
A. E. Zanoni.
Critical Reviews in Environment Control, Vol 3, Issue 3, p 225-260, May 1973. 5 fig, 14 tab, 139 ref.

Descriptors: *Water pollution sources, *Landfills, *Path of pollutants, *Groundwater, Groundwater movement, Leaching, Percolation, Infiltration, Garbage dumps, Biodegradation, Water pollution.

Man has been using the land for disposal of his solid wastes since he first began to generate these materials. Today sanitary landfill is the most common method for solid waste disposal. Once deposited, microorganisms in the presence of moisture begin to decompose the organic fraction of the solid waste. If sufficient water enters the refuse mass, either from the infiltration of rainwater or by the rising of the groundwater table, the end products of this microbial activity, plus the simple solution of the other materials from the inert fraction of the solid wastes, leach out of the refuse mass. Depending upon the hydrogeology of the landfill site, this leachate has the potential for polluting the groundwater. Fortunately, the soil regime provides an ideal environment for the attenuation of the leachates as a result of a combination of biological, chemical, and physical forces. It is possible to employ hydrogeological techniques to evaluate a potential landfill site and thus minimize the possibility of groundwater pollution. Also, more serious consideration is being given today to modifying a site or controlling the landfill operation, through the use of such techniques as leachate barriers, high rate stabilization, and leachate collection and treatment. (Knapp-USGS)
W73-12025

THE EFFECTS OF PLUGGING A DEEP ARTESIAN WELL ON THE CONCENTRATION OF CHLORIDE IN WATER IN THE WATER-TABLE AQUIFER AT HIGHLAND ESTATES, LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02F.
W73-12039

GEOLOGY FOR PLANNING IN ST. CLAIR COUNTY, ILLINOIS.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02F.
W73-12069

MOVEMENT AND QUALITY OF LONG ISLAND SOUND WATERS, 1971,
State Univ., of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 02K.
W73-12072

WATER QUALITY SURVEY OF THE POTOMAC ESTUARY EMBAYMENTS AND TRANSECTS.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 05A.
W73-12077

WATER QUALITY OF THE POTOMAC ESTUARY GILBERT SWAMP AND ALLEN'S FRESH AND GUNSTON COVE.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 02K.
W73-12078

STUDIES ON FRESHWATER MICRO-ORGANISMS: PHOSPHATASE ACTIVITY IN LAKES OF DIFFERING DEGREES OF EUTROPHICATION,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 05C.
W73-12089

LOCATION AND CONSEQUENCES OF 1,1,1--TRICHLORO-2,2-BIS (P-CHLOROPHENYL) ETHANE UPTAKE BY BACILLUS MEGATERIUM,
Michigan State Univ., East Lansing. Dept. of Microbiology and Public Health.
G. F. Hicks, Jr., and T. R. Corner.
Applied Microbiology, Vol 25, No 3, p 381-387, March 1973. 4 fig, 1 tab, 22 ref.

Descriptors: *DDT, *Pesticide toxicity, *Soil bacteria, *Absorption, Chlorinated hydrocarbon pesticides, Insecticides, DDD, Respiration, Lethal limit, Separation techniques.
Identifiers: *Bacillus megaterium, *Bioaccumulation, Bacterial physiology, Metabolites, Survival, Chemical recovery, 1 1 1-Trichloro-2 2-bis (p-chlorophenyl)ethane, Substrate utilization, Electron capture gas chromatography, 1 1-Dichloro-2 2-bis (p-chlorophenyl)ethane, Sample preparation.

No detrimental effects of 1,1,1-trichloro-2,2-bis (p-chlorophenyl)ethane (DDT) were observed when cells of Bacillus megaterium were grown from small inocula in nutrient media containing up to 100 micrograms of DDT/ml. However, when the ratio of DDT to biomass of resting cells was held constant, levels of DDT as low as 1 microgram/ml (0.5 microgram/mg of cell dry weight) enhanced the rate of death in the population. The lethal action of DDT was both time- and dose-dependent so that higher doses required less time to effect the same killing than did lower doses. Intact cells bound a maximum of about 1.7 micrograms of DDT/mg of cell dry weight, of which about 75 percent was localized in the protoplast membrane. Much of the bound DDT was subsequently lost to the suspending medium and the aqueous stability of the returned DDT was enhanced, possibly by association with solubilized cell materials. A small quantity of bound DDT was converted to 1,1-dichloro-2,2-bis (p-chlorophenyl)ethane, which was released from cells somewhat faster than DDT. Apparently the lethal action of DDT was related to its binding in the membrane, but respiration was not inhibited. The atypical macroscopic appearance of membranes isolated from treated cells suggested that cell death may result from altered membrane chemistry. (Holoman-Battelle)
W73-12091

ACCUMULATION OF DIELDRIN IN AN ALGA (SCENEDESMUS OBLIQUUS), DAPHNIA MAGNA AND THE GUPPY (POECILIA RETICULATA),
Michigan Univ., Ann Arbor. School of Natural Resources.
R. E. Reinert.
Journal of the Fisheries Research Board of Canada, Vol 29, No 10, p 1413-1418, October 1972. 7 fig, 11 ref.

Descriptors: *Dieldrin, *Chemical analysis, *Absorption, Water analysis, Aquatic algae, Waterfleas, Chlorinated hydrocarbon pesticides, Insecticides, Chlorophyta, Crustaceans, Aquatic animals, Invertebrates, Pollutant identification, Water analysis, Laboratory tests, Bioassay, Solvent extractions, Killifishes, Freshwater fish.
Identifiers: *Bioaccumulation, *Scenedesmus obliquus, *Daphnia magna, *Poecilia reticulata, Guppy, Macroinvertebrates, Electron capture gas chromatography, Sample preparation.

Scenedesmus obliquus, Daphnia magna, and Poecilia reticulata were exposed in the laboratory to different concentrations of dieldrin in water or food. After various periods of exposure, dieldrin was extracted with hexane and quantified by electron capture gas chromatography. Extraction efficiencies were determined from the analysis of 5 samples each of water or organisms to which known amounts of dieldrin had been added. The organisms accumulated dieldrin directly from water; average concentration factors (concentration in organism, dry weight, divided by concentration in water) were 1282 for the algae, 13,954 for Daphnia magna and 49,307 (estimated) for the guppy. The amount accumulated by each species at equilibrium (after about 1.5, 3-4 and 18 days, respectively) was directly proportional to the concentration of dieldrin in the water. Daphnia magna and guppies accumulated more dieldrin from water than from food that had been exposed to similar concentrations in water. When guppies were fed equal daily rations of Daphnia magna containing different concentrations of insecticide, the

amounts of dieldrin accumulated by the fish were directly proportional to the concentration in Daphnia magna; when two lots of guppies were fed different quantities of Daphnia magna (10 and 21 organisms per day) containing identical concentrations of dieldrin, however, the amounts accumulated did not differ substantially. (Holoman-Battelle)
W73-12098

TURNOVER AND VERTICAL TRANSPORT OF ZINC BY THE EUPHAUSIID MEGANYCTIPHANES NORVEGICA IN THE LIGURIAN SEA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
L. F. Small, and S. W. Fowler.
Marine Biology, Vol 18, No 4, p 284-290, February 1973. 2 fig, 6 tab, 16 ref.

Descriptors: *Zinc, *Path of pollutants, Heavy metals, Food abundance, Sea water, Mathematical models, Marine animals, Invertebrates.
Identifiers: *Transport, *Meganyctiphanes norvegica, Feces, Turnover, Ligurian Sea, Bioaccumulation, Elimination, Biotransformation, Molts, Carcasses, Vertical transport, Euphausiids, Macroinvertebrates, Mysids.

The participatory turnover time of ionic zinc by the adult Meganyctiphanes norvegica population in the Ligurian Sea ranged between 498 and 1243 years, depending upon the available food supply, and considering the food chain as the only route for zinc accumulation by the population. A total impact turnover time was calculated as the sum of the participatory turnover time for live individuals plus the time required for dead euphausiids to lose 90 percent of their zinc to the water. The net vertical transport of zinc by Meganyctiphanes norvegica from the sea surface to any specified depth can be calculated as the sum of the dissolved zinc excreted below the depth plus the concentrations of zinc left in feces, molts and carcasses after they have sunk to the specified depth. Feces represents the major route for delivering zinc to the bottom of the Ligurian Sea (2500 m) because concentration of the element in the pellets is so much higher than in carcasses or molts. Feces zinc represented over 80 percent of the total zinc transported to the sea floor if only marginal food supplies were available to the euphausiids, and over 90 percent if food was in sufficient supply. (Little-Battelle)
W73-12114

DELAYED-INCUBATION MEMBRANE-FILTER TEST FOR FECAL COLIFORMS,
Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 05A.
W73-12120

AMMONIA ASSIMILATION IN BLUE-GREEN ALGAE,
California Univ., Berkeley. Dept. of Bacteriology and Immunology.
A. H. Neilson, and M. Doudoroff.
Archiv fur Mikrobiologie, Vol 89, No 1, p 15-22, January 18, 1973. 6 tab, 23 ref.

Descriptors: *Ammonia, *Cyanophyta, *Aquatic algae, *Nitrogen compounds, Enzymes, Assay, Anabaena, Amino acids, Nitrates, Nitrogen, Cultures, Nutrient requirements.
Identifiers: *Assimilation, *Fate of pollutants, Substrate utilization, L-alanine, L-glutamine, L-asparagine, Sample preparation, L-glutamate, Synechococcus, Lyngbya, Oscillatoria, Microchaete, Aphanocapsa, Plectonema, Chlorogloeopis, Gloeocapsa, Microcystis, Calothrix.

The occurrence of alanine dehydrogenase (AlaDH), glutamate dehydrogenase (GDH), and 2-ketoglutarate:glutamine amidotransferase (G-GAT), has been surveyed in a number of blue-green algae. Among nine unicellular strains grown with nitrate, and belonging to five of the major typological groups, AlaDH was present in seven, and GDH in all eight that were assayed. In ten filamentous strains grown with nitrate, and belonging to the three nonheterocyst-forming and four heterocyst-forming groups, AlaDH was present in six, but both AlaDH and GDH were present in only one strain. In those strains which could be grown with N2 as sole nitrogen source, levels of GDH were generally lower, and AlaDH higher in cells fixing N2 than in those growing with nitrate. GGAT was undetectable in N2-grown cells. Two unicellular and three filamentous strains were tested for their ability to use L-alanine, L-glutamate, L-glutamine, and L-asparagine as sole sources of nitrogen. Of these, L-asparagine was utilized most effectively. There was little difference in levels of GDH in cells grown with nitrate or with L-asparagine, while the levels of AlaDH were slightly lower in cells grown with L-asparagine. (Holoman-Battelle)
W73-12125

OCCURRENCE AND DISTRIBUTION OF CYANOPHAGES IN PONDS, SEWAGE AND RICE FIELDS,
Central Rice Research Inst., Cuttack (India). Dept. of Blue-Green Algae.
For primary bibliographic entry see Field 05A.
W73-12126

EFFECT OF NITRATE, AMMONIA AND NITROGEN STARVATION ON THE REGULATION OF NITRATE REDUCTASE IN CYANIDIUM CALDARIUM,
Naples Univ. (Italy). Istituto di Botanica.
For primary bibliographic entry see Field 05C.
W73-12130

FEASIBILITY OF REMOTE DETECTION OF WATER POLLUTANTS AND OIL SLICKS BY LASER-EXCITED RAMAN SPECTROSCOPY,
Rhode Island Univ., Kingston. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-12137

METABOLISM OF PHENOL AND CRESOLS BY MUTANTS OF PSEUDOMONAS PUTIDA,
Monash Univ. Medical School, Prahran (Australia). Alfred Hospital.
R. C. Bayly, and G. J. Wigmore.
Journal of Bacteriology, Vol 113, No 3, p 1121120, March 1973. 2 fig, 7 tab, 25 ref.

Descriptors: *Phenols, *Metabolism, *Microbial degradation, Enzymes, Assay, Degradation (Decomposition), Aerobic bacteria.
Identifiers: *Cresol, *Pseudomonas putida, *Mutants, Bacterial physiology, Substrate utilization, 2-hydroxymuconic semialdehyde hydrolase, Growth media, Culture media, Mutagenesis, Catechol 2 3-oxygenase, NAD-aldehyde dehydrogenase.

Mutant strains of Pseudomonas putida strain U have been obtained which are deficient in enzymes of the degradative pathways of phenol and cresols. Mutant strains deficient in catechol 2,3-oxygenase accumulated the appropriate catechol derivative from cresols. A mutant strain which would not grow on either phenol or a cresol was shown to be deficient in both 2-hydroxymuconic semialdehyde hydrolase and a nicotinamide adenine dinucleotide, oxidized form, (NAD)-dependent aldehyde dehydrogenase. When this strain was grown in the presence of phenol or a cresol, the appropriate product of meta fission of these compoujnds accumulated in the growth medium. A partial revertant of this mutant strain, which was able to grow on ortho- and meta-cresol but not para-cresol, was shown to have regained only the hydrolase activity. This strain was used to show that the products of meta ring fission of the cresols and phenol are metabolized as follows: (1) ortho- and meta-cresol exclusively by a hydrolase; (2) para-cresol exclusively by a NAD-dependent aldehyde dehydrogenase; (3) phenol by both a NAD-dependent dehydrogenase and a hydrolase in the approximate ratio of 5 to 1. This conclusion is supported by the substrate specificity and enzymatic activity of the hydrolase and NAD-dependent aldehyde dehydrogenase enzymes of the wild-type strain. The results are discussed in terms of the physiological significance of the pathway. Properties of some of the mutant strains isolated are discussed. (HOoloman-Battelle)
W73-12139

POTENTIAL PATHOGENS IN THE ENVIRONMENT: ISOLATION, ENUMERATION, AND IDENTIFICATION OF SEVEN GENERA OF INTESTINAL BACTERIA ASSOCIATED WITH SMALL GREEN PET TURTLES,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-12150

MICROBIOLOGICAL QUALITY OF SURFACE DRAINAGE WATER FROM THREE SMALL IRRIGATED WATERSHEDS IN SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 05C.
W73-12151

BUTOMUS UMBELLATUS IN THE MISSISSIPPI WATERSHED,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 02I.
W73-12176

CHEMICAL CHARACTERISTICS OF UNDERGROUND CHALK WATER IN ESSEX AND SUFFOLK,
Essex River Authority (England).
K. Guiver.
Water Treat Exam. Vol 21, No 1, p 30-43. 1972. Illus.
Identifiers: Chalk water, Chemical characteristics, *England (Essex River), Groundwater, Infiltration, Saline water intrusion, Suffolk.

The results of analysis of a large number of samples taken from chalk boreholes are correlated for the Essex River Authority area. A general pattern of water quality is developed and associated with the London clay covering the chalk. Some discussion on the effects of saline infiltration and the annual variations of water quality expected from varying rainfall infiltration is given.—Copyright 1972, Biological Abstracts, Inc.
W73-12180

MERCURY: VERTICAL DISTRIBUTION AT TWO LOCATIONS IN THE EASTERN TROPICAL PACIFIC OCEAN,
Naval Undersea Research and Development Center, San Diego, Calif.
H. V. Weiss, S. Yamamoto, T. E. Crozier, and J. H. Mathewson.
Environ Sci Technol. Vol 6, No 7, p 644-645. 1972.
Identifiers: Coasts, *Mercury, *Mexico (West Coast), *Pacific Ocean, *Vertical distribution.

Hg concentrations at 2 locations off the west coast of Mexico were determined in the water column. At a station 60 km from the shore, pronounced fluctuations and greater Hg concentrations, 22-173 ng/kg, were measured compared with samples

taken 150 km from the coast in which the concentration range was 12-27 ng/kg.--Copyright 1972, Biological Abstracts, Inc.
W73-12186

MERCURY LEVELS IN MARINE BIOTA,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 05C.
W73-12195

SOIL CHANGES CAUSED BY EROSION CONTROL TREATMENTS ON A SALT DESERT AREA,
New Brunswick Univ., Fredericton. Dept. of Biology.
For primary bibliographic entry see Field 02G.
W73-12249

ENVIRONMENTAL STATEMENT, RIO BLANCO GAS STIMULATION PROJECT, RIO BLANCO COUNTY, COLORADO.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-12258

RADIONUCLIDES IN RIVER SYSTEMS,
Oak Ridge National Lab. Tenn.
D. J. Nelson, S. V. Kaye, and R. S. Booth.
In: River Ecology and Man (R.T. Oglesby and C.A. Carlson, Eds.), Academic Press, New York, 1972, p 367-387. 1 fig, 3 tab, 35 ref.

Descriptors: *Nuclear wastes, *Path of pollutants, *Rivers, *Effluents, Radioisotopes, Absorption, Food chains, Systems analysis, Sediments, Aquatic life, Forecasting, Radioecology, Radioactivity techniques, Tennessee, Public health, *Tennessee.
Identifiers: *Clinch River.

Experience with radionuclides in the Clinch River is reviewed briefly. The specific- activity-concept for prediction of uptake by aquatic organisms requires that stable and radioactive atoms are available to the same degree. To the extent that time factors are neglected, an overestimate may be obtained. Other schemes for modelling uptake by organisms and modelling of transport and retention by streams are described. Sources of radionuclide discharges to rivers are mentioned (nuclear power stations, fuel reprocessing plants, research laboratories, testing of weapons and the use of nuclear explosive for evacuation). (Bopp-ORNL)
W73-12259

INVESTIGATIONS OF THE FATE OF CERTAIN PESTICIDES UNDER BIOTIC AND ABIOTIC CONDITIONS USING TRACER TECHNIQUES,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
F. Korte, W. Klein, A. Suess, and H. Siegmund.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016; $6.00 for proceedings. In: Radiotracer Studies of Chemical Residues in Food and Agriculture, International Atomic Energy Agency, Vienna, p 35-45, 1972, 11 fig, 2 tab.

Descriptors: *Environmental effects, *Aldrin, *Insecticides, *Plant physiology, Radioactivity techniques, Carbon radioisotopes, Metabolism, Soil moisture, Leaching, Sorption, Analytical techniques, Pollutant identification, Chromatography, Pesticide residues, Soil contamination, Water pollution, Tracers, Marking techniques.

An example of the need to include conversion products in evaluation of environmental effects is given by this study of plant metabolism of C14-labeled aldrin insecticide. The water-soluble metabolite dihydrochlordene dicarboxylic acid constituted 20% of the residue in potatoes and about 40% in maize leaves, and metabolites constituted 80% of the residue in peeled beets and the leaves. (Bopp-ORNL)
W73-12261

UPTAKE OF MERCURY BY PLANTS AND ITS DISTRIBUTION IN LIVING ORGANISMS IN AN ENVIRONMENT WITH INCREASED CONCENTRATION OF THIS ELEMENT,
Ljubljana Univ. (Yugoslavia).
For primary bibliographic entry see Field 05C.
W73-12262

SOME REMARKS ON MERCURY AS AN AQUATIC POLLUTANT AND ITS IMPLICATIONS,
Helsinki Univ. (Finland). Dept. of Radiochemistry
For primary bibliographic entry see Field 05C.
W73-12263

CADMIUM CONTENT OF SEA WATER, BOTTOM SEDIMENT AND FISH, AND ITS ELIMINATION RATE IN FISH,
Helsinki Univ. (Finalnd). Dept. of Radiochemistry.
T. Jaakkola, H. Takahashi, R. Soininen, K. Rissanen, and J. K. Miettinen.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016; $6.00 for proceedings.

Descriptors: *Cadmium, *Environmental effects, *Estuarine environment, *Marine fish, Absorption, Food chains, Toxicity, Radioecology, Public health, Sediments, Mine water, Mineral industry, Mine wastes, Mills, Sculpins, Pikes, Water pollution sources, Water pollution effects, Industrial wastes, Path of pollutants, Monitoring.

Cadium levels were measured in unpolluted Finnish coastal waters (0.1-0.2 ppb in water, 3-10 ppb in dried organic sediments) and in a polluted area where a Zn refinery had been operating for 6 months and ore boats had been loaded for 6 years (5-20 ppb in water, 15-130 ppb in sediment). It appears that careful monitoring will be required to ensure that levels do not become hazardous (in Tsushima, Japan, 225 ppb in well water is suspected to have caused disease). In fish taken from polluted areas, the concentration in muscle was 10-70 ppb; in fish from unpolluted areas, 2-3 ppb. About 1% of a catheter-administered dose was retained by rainbow trout after 42 days with a relatively long biological half-time. (Bopp-ORNL)
W73-12264

SIGNIFICANCE OF MERCURY IN THE ENVIRONMENT: SUGGESTIONS FOR FURTHER RESEARCH,
Department of Agriculture, Saskatoon (Saskatchewan).
For primary bibliographic entry see Field 05C.
W73-12265

REACTIONS OF HERBICIDES WITH SOIL AND PLANTS,
Bayerische Landesanstalt fuer Bodenkultur, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
A. Suss, H. Siegmund, C. Eben, and B. Grampp.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016; $6.00 for proceedings. In: Radiotracer Studies of Chemical Residues in Food and Agriculture, International Atomic Energy Agency, Vienna, p 111-121, 1972, 16 fig, 1 tab, 2 ref.

Descriptors: *Vegetable crops, *Food chains, *Herbicides, *Absorption, Soil bacteria, Microbial degradation, Analytical techniques, Chromatography, Path of pollutants, Pollutant identification, Soil moisture.
Identifiers: Bacillus sphaericus, Thin layer chromatography.

C14-labelled herbicides (momolinuron, pyrazon and simazine) were used to study degradation by soil bacteria and uptake by mustard plants. Further work is needed to show whether contamination of food may result from plant uptake. During 24 days of growth, mustard plants absorbed 6% of the radioactivity from 5-ppm-labelled monolinuron in soil with 45-75% moisture; 5% with 30% moisture. One of the main metabolites formed by Bacillus sphaericus was 4-chloraniline, a possible precursor of hazardous diazo substances. (See also W72-14304). (Bopp-ORNL)
W73-12266

A SIMPLE METHOD FOR THE ACTIVATION ANALYSIS OF MERCURY IN FISH: MERCURY CONTENT IN VENEZUELAN CANNED TUNA,
Instituto Venezolano de Investigaciones Cientificas, Caracas.
For primary bibliographic entry see Field 05A.
W73-12267

A PLAN FOR THE CONSTRUCTION AND TESTING OF WATER POLLUTION FORECASTING MODELS,
Missouri Univ., Columbia. Dept. of Industrial Engineering.
L. G. David, and O. W. Miller.
In Proceedings (Vol I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 159-175 (1972). 2 fig, 5 tab, 3 ref.

Descriptors: *Water quality control, *Streams, *Water pollution, *Forecasting, *Mathematical models, Data collections, Planning, Construction, Testing, Systems analysis, Pollutants, *Missouri.
Identifiers: *Cuivre River Basin (Missouri), Pollutant concentration level.

The overall objective of water pollution control in the U.S. must be the effective control of the level of pollutants. A study is presented in which the kinds of water quality data presently being collected and available for analysis, and the degree of dependency relationship existing among the variables are determined. The objective is to develop a plan for constructing and testing a stream pollutant forecasting model. Chosen as the river basin for which to develop the plan was the Cuivre River (Missouri). Federal and State agencies are actively collecting data which may be used to predict the degree of pollutant contamination in a river basin. The Missouri Water Pollution Control Board recently completed a stream survey for the Cuivre River Basin, including the degree of concentration of 28 different pollutants. Rainfall data for this region is available from the U.S. National Weather Service. Agricultural inventory data is available from the University of Missouri for this area, and water quality data for this region is published by the U.S. Geological Survey. A step-by-step procedure is outlined for construction and evaluation of a comprehensive stream pollutant forecasting model which may be effective in forecasting the degree of pollutant concentration using, as much as possible, data from the agencies listed above. (See also W73-12269) (Bell-Cornell)
W73-12281

THE QUALITY OF COASTAL WATERS: FIRST ANNUAL PROGRESS REPORT,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. S. Lau.
Available from NTIS, Springfield, Va. 22151 as COM-73-10144 Price $3.00 printed copy; $1.45 microfiche. Technical Report No. 60, September 1972. 213 p, 48 fig, 68 tab, 49 ref, 3 append. NOAA UNIHI-SG-72-01.

Descriptors: *Water quality, *Coasts, *Hawaii, *Water pollution sources, Environmental effects,

Land use, Urbanization, Industrial wastes, Municipal wastes, Sediments, Estuaries, Bays, Ecology, Economic aspects, Social aspects, Data collections, Evaluation, Water pollution effects, Hydrology, Oceanography.

The nature and results of the first year of study on the Coastal Water Quality project of the University of Hawaii's Sea Grant Program are summarized. The project is a multidirectional, multidisciplinary study directed to the general objectives of identifying and evaluating the social political, economic, educational, instittional, and scientific and technological factors which impede or expedite the protection and restoration of coastal water environments in Hawaii. Kahana Bay was selected as a coastal water under the influence of relatively undeveloped land. Sugarcane prodection and milling wastes were studied on Kauai. The effects of urban waste water, especially sewage, were studied with the city and county of Honolulu and the federal agencies engaged in major investigations and projects such as sewage treatment at Sand Island, Pearl Harbor, Kaneohe Bay, and Mokapu Point. The identification and evaluation of the separate effects of various land uses on the quality of coastal waters is interpreted in terms of changes in the institutional, economic, and social systems needed to achieve the environmental objectives of the state. (Woodard-USGS)
W73-12295

THE DISTRIBUTION OF DISSOLVED MERCURY IN THE BRISTOL CHANNEL AND SEVERN ESTUARY,
Liverpool Univ. (England). Dept. of Oceanography.
D. Gardner, and J. P. Riley.
Estuarine and Coastal Marine Science, Vol 1, No 2, p 191-192. April 1973. 1 fig, 11 ref.

Descriptors: *Mercury, *Path of pollutants, *Estuaries, Water chemistry, Adsorption, Bottom sediments, Distribution patterns, Sampling, Water analysis, Water chemistry.
Identifiers: *Severn Estuary (England).

The concentration of dissolved and particulate mercury was determined in the Bristol Channel and Severn Estuary, England. The distribution of both forms of the element are consistent with the water circulation pattern. The range of concentrations found below Cardiff is very similar to that observed for the sea. On passing downstream from Cardiff the dissolved mercury concentration drops from >50 mg per liter to values of <10 mg per liter in the central area of the Bristol Channel. Seawards of this region the concentrations rises to levels of 30-50 ng per liter which are similar to those found in the Southern Irish Sea. The very strong adsorptive affinity of particulate matter for mercury probably plays an important part in the establishment of this distribution pattern. Dissolved mercury contained in effluents will be rapidly taken up by the suspended sediment in the river. Consistent with this picture particulate mercury was found to range from >200 ng per liter around Cardiff down to values of approximately 100 ng per liter around a line between Nash Point and Porlock. (Knapp-USGS)
W73-12301

THE ENVIRONMENTAL IMPACT OF GROUND WATER USE ON CAPE COD--IMPACT STUDY NO. 3,
A. N. Strahler.
The Association for the Preservation of Cape Cod, Inc, Orleans, Mass, 1972. 68 p, 1 plate, 24 fig, 2 tab, 6 ref. Price: $1.25.

Descriptors: *Water resources development, *Massachussetts, *Hydrogeology, Withdrawal, Saline water intrusion, Water pollution sources, Environmental effects, Water balance, Water yield.
Identifiers: *Cape Cod (Mass).

Groundwater (including pond water) is Cape Cod's only natural source of freshwater. Development of this water supply to meet needs, and at the same time to preserve the high quality of the groundwater and the water level of the freshwater ponds, requires strict attention to the basic principles of groundwater movement and recharge. Cape Cod has escaped noticeable lowering of the water table because of the return of a large proportion of used water through domestic wells in conjunction with these individual septic tank units has dispersed the sources of water withdrawal and at the same time effectively returned much of the used water close to the points of extraction. If development proceeds, first by installation of town water systems, then by installation of sanitary sewer systems with ocean outfall, the situation will deteriorate. (Knapp-USGS)
W73-12303

ANGULAR DEPENDENCE OF SUBSTITUENT EFFECTS IN RIGID, BICYCLIC SYSTEMS,
Georgia Inst. of Tech., Atlanta. School of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12305

REMOTE SENSING STUDY OF THERMAL DISCHARGES TO LAKE MICHIGAN, WISCONSIN, ILLIONOIS, INDIANA, AND MICHIGAN.
National Field Investigations Center-Denver, Colo.

Available from NTIS, Springfield, Va 22151 as PB-214 503 Price $3.00 printed copy; $1.45 microfiche. Office of Enforcement Publication, September 1972. 36 p, 19 fig.

Descriptors: *Thermal pollution, *Electric powerplants, *Lake Michigan, *Remote sensing, Aerial photography, Data collections, Water temperature, Heated water, Water pollution sources, *Path of pollutants, Legal aspects.

An areal reconnaissance was conducted along segments of the shoreline of Lake Michigan on September 14, 1972, to document the extent of thermal discharges from the major electric powerplants over the area extending from Muskegon, Michigan, to Twin Creeks, Wisconsin. Ten power stations were in operation at the time of flight, and three plants were not in operation. Nine of the 10 plants in operation were violating the recommended 3 deg F maximum temperature increase at the distance of 1,000 feet from the outfall. In addition, six of the power plants were also violating this permitted 3 deg F increase even at a distance of 2,000 feet from the plant discharge. None of the discharges caused the surface temperature of the receiving water, at the 1,000-ft point, to exceed the maximum allowable surface temperature limit for September of 80 deg F. The data indicate that the recommendations of the Lake Michigan Enforcement Conference are not being met by many thermal and industrial discharge sources. (Woodard-USGS)
W73-12309

STATE UNIVERSITY OF NEW YORK, COLLEGE AT PLATTSBURGH, LAKES AND RIVERS RESEARCH LABORATORY 1972 TECHNICAL REPORT.
February 1973. 205 p.

Descriptors: *Limnology, *Lakes, *New York, Ecology, Lead, Nitrates, Phosphates, Mathematical models, Hypsometric analysis, Bibliographies, Organic matter, Nutrients, *Path of pollutants.
Identifiers: *Lake Champlain.

The Lakes and Rivers Research Laboratory of the State University of New York, College at Plattsburgh serves multiple needs. Operating as part of the Faculty of Science and Mathematics it helps to furnish the faculty members at Plattsburgh interested in limnology with much of the needed equipment and supplies for their research endeavors. A laboratory of about 1200 square feet is utilized by faculty and students engaged in lake related research. The papers presented are a sample of the variety of projects that the Lakes and Rivers Research Laboratory has been engaged in over the past year. The topics discussed are toxicity of lead nitrate to algae; seasonal and spatial distribution of phosphates, nitrates, and silicates in Lake Champlain; orthophosphate concentrations and distributions in Northwest Bay; aquatic modeling; a general model for vertical thermal stratification in ice free lakes; hypsometry of Lower Chateaugay Lake, a Pond on the Saranac River, and Harris Lake; and dissolved organic matter in natural waters, a bibliography. (See W73-12322 thru W73-12329) (Knapp-USGS)
W73-12321

TOXICITY OF LEAD NITRATE TO FIVE SPECIES OF FRESHWATER ALGAE,
State Univ. Coll., Plattsburgh, N.Y. Miner Inst. of Man and His Environment.
For primary bibliographic entry see Field 05C.
W73-12322

STUDIES ON THE SEASONAL AND SPATIAL DISTRIBUTION OF PHOSPHATES, NITRATES, AND SILICATES IN LAKE CHAMPLAIN,
State Univ. Coll., Plattsburgh, N.Y. Dept. of Biological Sciences.
G. K. Greundling, and J. L. Malanchuk.
In: State University of New York Lakes and Rivers Research Laboratory 1972, Technical Report, p 25-50, February 1973. 7 fig, 1 tab, 13 ref, 3 append.

Descriptors: *Nutrients, *Lakes, *New York, Data collections, Limnology, Phosphates, Silica, Nitrates.
Identifiers: *Lake Champlain.

Major nutrient concentrations were measured during 1970 in Lake Champlain, New York. Nitrates in the northeast arm stations are significantly different throughout the year from the open lake and bays stations in the western portion of the lake. Seasonal trends of high concentrations of soluble nitrate in the spring, winter, and fall, and low concentrations in the summer, probably reflect various stages of runoff, turnover, and phytoplankton uptake. The general trend of silica for the lake is that concentrations are high during the spring and then drop off rapidly during and immediately after the spring diatom bloom. Silicate concentrations are generally higher at the western bay and western open stations during the winter and early spring, but then drop off to values lower than the northeast arm during the summer and fall. The high values in the spring can probably be explained by the fact that the bay stations receive large amounts of runoff from the nearby land and river systems. The rapid decrease in values during late spring and summer are probably due to dilution of inputs by mixing and the uptake of silicon by diatoms. There are very few times that any detectable soluble phosphate was measured in any areas of the lake. Most of it is taken up by planktonic organisms. There is much less difference between stations than concentrations of other major nutrients measured. (See also W73-12321) (Knapp-USGS)
W73-12323

ORTHOPHOSPHATE CONCENTRATIONS AND DISTRIBUTIONS IN NORTHWEST BAY: 1971--1972,
R. J. Bobka.
In: State University of New York Lakes and Rivers Research Laboratory 1972, Technical Report, p 51-55, February 1973. 1 fig, 6 ref.

Descriptors: *Phosphates, *Lakes, *New York, Sewage treatment, Eutrophication, Limnology, Nutrients, Outfall sewers, Path of pollutants, Treatment facilities.
Identifiers: *Westport (NY), *Lake Champlain.

In 1971 the Village of Westport, New York, began to operate a secondary sewage treatment plant. Prior to 1971 the village had no central sewage treatment facility and waste water reached Northwest Bay, Lake Champlain, by natural routes. The situation at Westport afforded a convenient opportunity to observe phosphate concentration and distribution over a period of years following the beginning of operation of a new sewage treatment plant. The average bottom-surface phosphate concentrations in Northwest Bay are generally high, about 150 ugm/liter, especially at the inshore areas. Farther out in Lake Champlain, phosphate concentrations are 40-60 ugm/liter. The average phosphate concentration in the vicinity of the outfall is in excess of 200 ugm/liter. (See also W73-12321) (Knapp-USGS)
W73-12324

MODULES FOR INTEGRATED AQUATIC MODELING,
W. A. Gavryck, and M. Katzper.
In: State University of New York Lakes and Rivers Laboratory 1972, Technical Report, p 56-80, February 1973. 6 fig, 6 ref, 2 append.

Descriptors: *Mathematical models, *Ecosystems, *Limnology, Ecology, Simulation analysis, Lakes, Systems analysis, Computer programs.
Identifiers: *Lake Champlain.

An approach to aquatic modeling and simulation incorporates physical, biological, and chemical factors, all modeled and developed in modular form. Each module can be studied and tested individually and subsequently combined with others, resulting in an overall simulation model of the entire system. The modules allow for the study of individual biological components as functions of many physical and chemical controlling factors. When the individual constituents are combined some of these physical and chemical factors become interaction factors of the combined units and form part of the internal self-regulation of the system. (See also W73-12321) (Knapp-USGS)
W73-12325

A GENERAL MODEL FOR VERTICAL THERMAL STRATIFICATION IN ICE FREE LAKES,
State Univ. Coll., Plattsburgh, N.Y.
For primary bibliographic entry see Field 02H.
W73-12326

HYPSOMETRY OF LOWER CHATEAUGAY LAKE AND A POND ON THE SARANAC RIVER,
For primary bibliographic entry see Field 02H.
W73-12327

HYPSOMETRIC MAP OF HARRIS LAKE, NEW YORK,
State Univ. Coll., Plattsburgh, N.Y.
For primary bibliographic entry see Field 02H.
W73-12328

DISSOLVED ORGANIC MATTER IN NATURAL WATERS: A SELECTED BIBLIOGRAPHY, WITH EMPHASIS ON ANALYTICAL METHODS,
State Univ. Coll., Plattsburgh, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 02H.
W73-12329

A PEDOCHEMICAL SURVEY: I. LITHIUM,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02K.
W73-12331

WIND DISSEMINATION OF WATERBORNE ERWINIA AMYLOVORA FROM PYRUS TO PYRACANTHA AND COTONEASTER,
Iowa State Univ., Ames. Dept. of Horticulture.
For primary bibliographic entry see Field 03F.
W73-12338

5C. Effects of Pollution

DISTRIBUTION OF MERCURY, CADMIUM, LEAD AND THALLIUM IN A EUTROPHIC LAKE,
Bradley Univ., Peoria, Ill. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-11707

FEEDLOT WASTE UTILIZED EFFICIENTLY BY ANIMALS.
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 05B.
W73-11762

WHY NITRATES IN WATER SUPPLIES,
For primary bibliographic entry see Field 05B.
W73-11765

IMPROVED BEEF CONFINEMENT FACILITIES THROUGH PIT VENTILATION AND TEMPERED AIR INTAKES,
Northern States Power Co., Minneapolis, Minn.
M. Nabben.
Paper presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper No. 72-449, 7 p.

Descriptors: *Ventilation, *Farm wastes, *Viruses, Animal diseases, Cattle.
Identifiers: Fogging, Velometer test.

The high incidence of virus pneumonia in animals with cough problems in a feeder beef cattle herd prompted the owner and veterinarian to seek the cause and solution. They believed that the ventilation system (which is described in detail) was the main factor causing illness. The air flow patterns in the building were rearranged; exhaust fans were installed to remove gases created in the liquid manure pit; and electric heaters were installed in every fresh air intake to eliminate fogging. Before these changes were made, there was a 10% death loss of cattle and frequent visits were made by the veterinarian. After the changes were made (during the 1971-72 winter), there were no deaths nor veterinarian trips. (Dudley-East Central)
W73-11775

WASTE-CAUSED AIR POLLUTANTS ARE MEASURED IN SWINE BUILDINGS,
Illinois Univ., Urbana. Agricultural Experiment Station.
For primary bibliographic entry see Field 05A.
W73-11778

OIL AND ICE IN THE ARCTIC OCEAN: POSSIBLE LARGE-SCALE INTERACTIONS,
Geological Survey, Tacoma, Wash. Ice Dynamics Project.
For primary bibliographic entry see Field 05B.
W73-11839

THE DOSE TO MAN VIA FOOD-CHAIN TRANSFER RESULTING FROM EXPOSURE TO TRITIATED WATER VAPOR,
California Univ., Livermore. Lawrence Livermore Lab.
L. R. Anspaugh, J. J. Koranda, W. L. Robison, and J. R. Martin.
Available from NTIS, Springfield, Va 22151 as CONF-710809-19, Price $3.00 printed copy, $1.45 microfiche. Preprint UCRL-73195 Rev I, July 13, 1972. 27 p, 4 fig, 4 tab, 39 ref.

Descriptors: *Pollutants, *Tritium, *Water vapor, Ecosystems, Food chains, Forecasting, Model studies, Radioactive wastes.
Identifiers: Human consumption (Tritium).

A model is described that predicts doses to man resulting from food-chain contamination due to exposure to tritiated water vapor. It incorporated knowledge concerning the environmental behavior of tritiated water which was obtained during radioecology studies. The model is specifically directed to the prediction of dose from the release of tritiated water vapor from a point source, but most of the model is applicable to any tritiated water vapor exposure. Dose commitments via inhalation plus absorption and via the ingestion of vegetables, milk, and meat are considered. The model may be entered with a variety of input data. Average values of the parameters needed to evaluate the model are provided. (Woodard-USGS)
W73-11851

THE EFFECTS OF REFUSE-TIP LIQUOR UPON STREAM BIOLOGY,
P. M. Nuttall.
Environmental Pollution, Vol 4, No 3, p 215-222, April 1973. 1 fig, 2 tab, 15 ref.

Descriptors: *Water pollution effects, *Fungi, *Oligochaetes, *Diptera, *Crustaceans, *Stoneflies, *Mayflies, *Caddisflies, *Water beetles, *Mollusks, Dominant organisms, Industrial wastes, Nutrients, Streams, Nitrates, Nitrites, Calcium, Magnesium, Iron, Phosphates, Benthic fauna, Sampling, Toxicity.
Identifiers: *Refuse-tip liquor, *Turbellaria, *Hirudinea, Macroinvertebrates, Sewage fungi, Chironomids, Midges, Leeches, Beetles, Scuds, Skimmers, Black flies, Phagocata vitta, Polycelis spp., Nais spp., Branchiura sowerbyi, Rhyacodrilus coccineus, Tubifex spp., Lumbriculus variegata, Stylodrilus heringianus, Enchytraeidae, Eiseniella tetrahedra, Helobdella stagnalis, Glossiphonia complanata, Gammarus pulex, Amphinemura spp., Isoperla grammatica, Brachyptera risi, Chloroperla torrentium, Leuctra hippopus, Nemurella picteti, Nemoura cinerea, Perlodes microcephala, Protonemoura meyeri, Rhabdiopteryx acuminata, Baetis rhodani, Ecdyonurus dispar, Ephemerella notata, Paraleptophlebia submarginata, Rhithrogena semicolorata, Hydropsyche instabilis, Limnephilidae, Polycentropus kingi, Rhyacophila dorsalis, Sericostoma personatum, Silo nigricornis, Elmis aenea, Gyrinus, Limnius volckmari.

An assessment was made of the effects of drainage from five refuse-tips upon the biology of the receiving watercourses. Refuse-tip liquor is a complex suspension and solution of organic and inorganic constituents, with an acid pH, high conductivity and usually high concentration of iron in solution. Phosphate content is high and nitrogen, as free and saline ammonia, is usually high. Refuse-tip liquor tends to have a high BOD and causes severe de-oxygenation of the river at the point of discharge. Three refuse-tips were found to be the cause of gross pollution of the stream, resulting in massive growths of sewage fungus Leptomitus lacteus, with the invertebrate community dominated by the oligochaete Nais elinguis over a considerable distance downstream. Chironomidae and the oligochaetes Tubifex ignotus, Tubifex tubifex and Lumbriculus

variegata were frequent immediately below discharges. The absence of many invertebrate species appears to be associated with the presence of massive growths of sewage fungus in the stream trapping silt and blocking the interstices between stones, and the increase in pollution. (Little-Battelle)
W73-11859

ABUNDANCE AND DIVERSITY OF MOLLUSCA IN AN INDUSTRIALIZED PORTION OF THE OTTAWA RIVER NEAR OTTAWA-HULL, CANADA,
Ottawa Univ. (Ontario). Dept. of Biology.
G. L. Mackie, and S. U. Qadri.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 167-172, February 1973. 1 fig, 3 tab, 14 ref.

Descriptors: *Water pollution effects, *Ecological distribution, *Spatial distribution, *Gastropods, *Industrial wastes, *Standing crops, Mollusks, Snails, Clams, Pulp wastes, Pulp and paper industry, Outlets, Bottom sampling, Aquatic plants, Water quality, Water sampling, Organic wastes, Wood wastes, Sewage effluents, Water chemistry, Downstream, Upstream, Benthic fauna, Invertebrates, Aquatic animals, Biochemical oxygen demand, Water analysis, Water properties, Chemical analysis, Velocity, Dissolved oxygen, Surface water, Hypolimnion, Hardness (Water), Coliforms, Nitrates, Nitrites, Phosphates, Hydrogen ion concentration, Carbon dioxide, Conductivity, Food processing industry, Aquatic weeds, Pondweeds, Effluents, Pollutants, Alkalinity, Calcium, Phenols, Sulfates, Turbidity.
Identifiers: *Ottawa River, *Pelecypods, *Species diversity, *Species density, Slaughterhouse wastes, Macroinvertebrates, Goniobasis livescens, Helisoma spp., Pomatiopsis lapidaria, Lymnaea catascopium, Amnicola spp., Probythinella lacustris, Valvata spp., Gyraulus spp., Promenetus exacuous, Physa gyrina, Ferrissia parallela, Campeloma decisum, Bithynia tentaculata, Sphaerium spp., Pisidium spp., Elliptio complanatus, Lampsilis radiata, Fecal coliforms, Orthophosphates, Britannia Bay, Macrophytes, Potamogeton spp, Elodea canadensis, Wild celery, Vallisneria americana, Myriophyllum heterophyllum, Myriophyllum heterophyllum, Myriophyllum alterniflora, Water weeds, Water milfoil, Brewery Creek, Kettle Island, Pouch snails, Pond snails, Orb snails, Ekman grab.

The abundance and diversity of Gastropoda and Pelecypoda were compared during May-November 1968 in portions of the Ottawa River near Ottawa-Hull immediately upstream and downstream of outfalls from a slaughter house and two pulp and paper mills. Weekly determinations were made on both bottom and surface waters at 5 sites of velocity, dissolved oxygen and carbon dioxide, pH, and conductivity. Every 2 weeks bottom and surface waters were analyzed for 15 parameters, including BOD, orthophosphate, nitrate, nitrite, calcium hardness, total coliform and total fecal coliform bacteria. Gastropods and pelecypods were sampled using a random sampling technique and the Ekman grab. Percentage estimates of organic matter in the sediments were made by ashing after removal of all animals and weighing 3 samples from each station. Organic pollution was a major factor in limiting the abundance and diversity of Gastropoda and Pelecypoda in the Ottawa River near Ottawa-Hull. Analyses of the 472 Ekman grab samples showed that the average standing crop (no./sq m) of mollusks was larger in areas immediately upstream than in areas immediately downstream of slaughter house and pulp and paper mill outfalls. (Holoman-Battelle)
W73-11862

NESTING BASS OBSERVED WITH UNDERWATER TELEVISION,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05A.
W73-11864

PREPARING TELEOST EMBRYOS FOR STUDY,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05A.
W73-11865

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF MAINE YANKEE ATOMIC POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No 50309-61. $7.60 per copy, $1.45 microfiche. Docket No 50309-61, July 1972. 229 p, 13 fig, 24 tab, 58 ref, 1 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Maine.
Identifiers: *Pressurized water reactors, *Montsweag Bay, *Sheepscot River Estuary, Environmental impact statements.

This final environmental statement relates to the issuance of an operating license for the Maine Yankee Atomic Power Station. This station is located near Wiscasset in Lincoln County, Maine, and will employ a pressurized water reactor with a once-through cooling system receiving water from and discharging into Montsweag Bay, a part of the Sheepscot River Estuary. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to issue an operating license for the facility subject to the following conditions: (1) Remove Cowseagan Causeway and replace with an appropriate bridge. (2) Monitor water temperatures outside Bailey Cove. (3) Enact operational monitoring program to assess long-term effect on biota. (4) If adverse effects occur, corrective action is required. (Houser-ORNL)
W73-11899

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF ZION NUCLEAR POWER STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50295-74, $10.60 per copy, $1.45 microfiche. Docket No 50295-74, Dec 1972. 335 p, 19 fig, 32 tab, 177 ref, 17 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Lake Michigan, Illinois.
Identifiers: *Pressurized water reactors, Environmental impact statements.

This final environmental statement relates to the proposed construction and operation of the Zion Nuclear Power Station. The power plant is located in Zion, Illinois, and will consist of two units, each using a pressurized-water reactor and cooled by a once-through system discharged to Lake Michigan. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permits and issue an operating license subject to the following conditions: (1) Perform certain radiological and nonradiological monitoring programs concerned with the thermal plume and deicing operations. (2) Develop design modifications to the condenser cooling-water intake structure and install if needed to minimize the fish kill. (3) Provide an analysis and course of action to alleviate detrimental effects or damage found as a result of plant operation. (Houser-ORNL)
W73-11900

APPLICATIONS OF A DERIVED FORMULA FOR THE DISCHARGE OF RADIOACTIVE LIQUID WASTES,
Comitato Nazionale per l'Energia Nucleare, Rome (Italy).
G. Branca, F. Breuer, A. A. Cigna, and R. Amavis.
Available from NTIS, Springfield, Va., as EUR-4897e; $4.00 in paper copy, $1.45 in microfiche. Report EUR 4897e, 1973. 35 p, 7 tab, 17 ref.

Descriptors: *Food chains, *Nuclear wastes, *Path of pollutants, *Mathematical models, Radioisotopes, Absorption, Freshwater fish, Effluents, Rivers, Lakes, Potable water, Strontium radioisotopes, Cobalt radioisotopes, Tritium, Milk.
Identifiers: Cerium radioisotopes, Ruthenium radioisotopes, Iron radioisotopes, Manganese radioisotopes, Plutonium.

Discharge limits (in Curies/year) to a typical aquatic receiving environment for radioisotopes from nuclear power stations are calculated for exposure pathway via consumption of lake fish (Sr90, 0.68; Cs137, 5; Ru106, 370; and Co60, 128) and drinking water (Ru106, 90; others higher than for fish consumption). Concentration factors for radioisotope uptake by fish for these and other elements (tritium, Ce, Pu, Mn, Fe, Co), and discharge limits for other aquatic receiving environments are tabulated. For atmospheric discharge of I131 to the environment considered, the rainout-fodder-milk-infant pathway set a discharge limit of 30 Curies/year. (See also W72-12198) (Bopp-ORNL)
W73-11901

NATIONAL ACCELERATOR LABORATORY, BATAVIA, ILLINOIS. (ENVIRONMENTAL STATEMENT).
Atomic Energy Commission, Washington, D.C.

Available from NTIS, Springfield, Va., as Report WASH-1505. $5.45 per copy, $1.45 microfiche. Report No. WASH-1505, Dec 1971. 56 p, 9 fig, 10 ref, 4 append.

Descriptors: Nuclear physics, *Atomic plants, *Water pollution, *Water pollution sources, *Water cooling, *Thermal pollution, Nuclear wastes, Radioactive wastes, Ecology, Sites, Environment, Reservoir storage, Retention, Regulation, Natural resource, Public health.
Identifiers: *Accelerator, High energy physics, Environmental Impact Statements.

This environmental statement relates to the proposed construction and operation of a National Accelerator Laboratory (NAL) at Batavia, Illinois. The cooling system will be a combination of evaporative cooling and air cooling. The water

source will be run-off water collected in a catch basin and from shallow wells with the Fox River and a deep well as a backup system. Heated water will be returned to the retention pond. Environmental impacts are assessed, alternatives considered, and a benefit-cost summary compiled. After weighing the benefits of this proposed course of action against the environmental cost of implementing it, and considering the available alternatives, it is concluded that the AEC should proceed to completion of design and construction of NAL and to subsequent operations at the planned energy levels. (Houser-ORNL)
W73-11902

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SURRY POWER STATION UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50281-73. $7.60 per copy, $1.45 microfiche. Docket 50281-73, June 1972. 290 p, 39 fig, 32 tab, 174 ref, 10 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Virginia, James River.
Identifiers: *Pressurized water reactors, Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed issuance of operating license for the Surry Power Station Unit 2 and considers the environmental impact of Units 1 and 2. This station is located in Surry County, Virginia, and will be cooled by water from and returned to the James River. Each unit will employ a pressurized water reactor. Environmental impacts were assessed, and, after consideration of alternatives, an environmental benefit-cost summary was compiled. Environmental factors considered include hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permit and issue an operating license for Unit No. 2 subject to the following conditions: (1) perform both radiological and non-radiological programs for a minimum of three years to determine impact of operations, (2) monitor the number and species of fish kills attributed to operation of the station. (Houser-ORNL)
W73-11903

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF KEWAUNEE NUCLEAR POWER PLANT.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50305-61, $10.60 per copy, $1.45 microfiche. Docket 50305-61, December 1972. 354 p, 29 fig, 54 tab, 167 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Wisconsin.
Identifiers: *Pressurized-water reactors, Carlton Township (Wis), Environmental Impact Statements.

This final environmental statement relates to the proposed continuation of construction and operation of the Kewaunee Nuclear Power Plant. The plant is located in Carlton, Wisconsin, and will use a pressurized-water reactor cooled by once-through cooling water from Lake Michigan. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permit and issue an operating license for the facility subject to the following conditions: (1) Monitor for biotic effects of plant discharge plume. (2) Monitor fish movement, plankton displacement, and toxicological aspects of discharge water to fish. (3) Evaluate thermal pollution effects. (4) Monitor the hydrological conditions under various circumstances. (5) Monitor residual chlorine concentrations. (6) Radiologically monitor the plant environs. (7) Monitor erosion of shoreline. (8) Provide a plan of action to eliminate or reduce any harmful effects found. (Houser-ORNL)
W73-11904

REPORT ON RELEASES OF RADIOACTIVITY IN EFFLUENTS FROM NUCLEAR POWER PLANTS FOR 1971.
Directorate of Regulatory Operations (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-11905

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF FORT CALHOUN STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No. 50285-71. $7.60 per copy, $1.45 microfiche. Docket 50285-71, Aug 1972. 272 p, 11 fig, 28 tab, 73 ref, 4 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Nebraska, Missouri River.
Identifiers: *Pressurized water reactors, Environmental Impact Statements.

This final environmental statement relates to the proposed continuation of construction and issuance of an operating license for the Fort Calhoun Station Unit No. 1. The plant is located on the Missouri River near Blair, Washington County, Nebraska, and will employ a pressurized-water reactor cooled by once-through flow of water obtained from and discharged to the Missouri River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to continue the construction permit and to issue an operating license for the facility subject to the following conditions: (1) continue nonradiological monitoring program for assessment of effects on the aquatic environment; (2) monitor the number and species of fish killed due to operation of the station; (3) carry out a radiological monitoring program to determine any radiological effects due to operation of the station; (4) provide an analysis and a course of action to alleviate any harmful effects. (Houser-ORNL)
W73-11906

MODELING IN THE EASTERN DECIDUOUS FOREST BIOME,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 02E.
W73-11907

ENVIRONMENTAL MONITORING REPORT FOR SANDIA LABORATORIES FROM 1964 THROUGH 1972,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 05A.
W73-11908

ENVIRONMENTAL MONITORING IN THE VICINITY OF THE LOS ALAMOS SCIENTIFIC LABORATORY - CALENDAR YEAR 1972.
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 05A.
W73-11909

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE ARKANSAS NUCLEAR ONE UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50313-64; $10.60 per copy, $1.45 microfiche. Docket No. 50313-64, Feb 1973. 369 p, 46 fig, 43 tab, 181 ref, 6 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Arkansas.
Identifiers: *Pressurized water reactors, Environmental Impact Statements.

This final environmental statement relates to the proposed issuance of an operating license for the Arkansas Nuclear One Unit 1 power plant. This plant is located on a peninsula on the northern shores of Lake Dardanelle, an impoundment of the Arkansas River system. The site is in Arkansas, County of Pope. Unit 1 of this plant will employ a pressurized-water reactor cooled by a once-through type of cooling system. Unit 2 will have the same type of reactor, cooled by natural-draft cooling tower. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue an operating license for the facility subject to the following conditions: Perform monitoring programs of Lake Dardanelle to determine aquatic-biological impact, fish killed on intake screens, thermal monitoring of plume, control radioactivity releases, and residual chlorine in discharge. These monitoring programs will be defined by the applicant and included in the technical specifications. An analysis of and a

course of action to alleviate any impact problem is required. (HouseriORNL)
W73-11913

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED HANFORD NUMBER TWO NUCLEAR POWER PLANT.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50397-33; $7.60 per copy, $1.45 microfiche. Docket 50397-33, December 1972. 281 p, 24 fig, 31 tab, 172 ref, 3 append.

Descriptors: *Columbia River, *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Washington.
Identifiers: *Environmental Impact Statements, *Boiling-water reactors.

This final environmental statement relates to the proposed construction of the Hanford No. Two Nuclear Power Plant. This plant is located in the state of Washington, County of Benton, near the city of Richland, and will employ a single-cycle forced-circulation, boiling-water reactor cooled by an evaporative, forced-draft cooling tower system. Makeup water and blowdown from the cooling towers will be taken from and discharged to the Columbia River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded to issue a construction permit for the facility subject to the following conditions: (1) Construct a meteorology tower to provide data for assessing adverse environmental effects. (2) Immobilize chemicals discharged to the soil. (3) Incorporate three additional radiological monitoring stations into the system to discriminate between releases from the plant and other sources. (Houser-ORNL)
W73-11917

THE POTENTIAL RADIOLOGICAL IMPLICATIONS OF NUCLEAR FACILITIES IN THE UPPER MISSISSIPPI RIVER BASIN IN THE YEAR 2000.
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-11918

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF DAVIS-BESSE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50346-41, $7.60 per copy, $1.45 microfiche. Docket 50346-41, March 1973. 287 p, 25 fig, 42 tab, 128 ref, 13 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Ohio, Lake Erie, Thermal pollution, Tritium.
Identifiers: *Environmental Impact Statements, *Pressurized water reactors.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continuation of construction permit of the Davis-Besse Nuclear Power Station, Ottawa Co., Ohio; a pressurized water reactor cooled by water through a single hyperbolic natural-draft cooling tower. Makeup water will come from Lake Erie. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded to continue the construction permit, subject to certain specified monitoring programs and design criteria for residual chlorine concentration. (Houser-ORNL)
W73-11920

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT - JULY-DECEMBER, 1971,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05A.
W73-11923

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1972,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05A.
W73-11924

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF SHEARON HARRIS NUCLEAR POWER PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing, (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50400-43; $10.60 per copy, $1.45 microfiche. Docket 50400-43, 338 p, 20 fig, 41 tab, 170 ref. (1973).

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis.
Identifiers: Atomic Energy Commission, Environmental impact statements, *Pressurized water reactors.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of four pressurized water reactors of the Shearon Harris Nuclear Power Plant. This plant is located near Raleigh, N. C. The exhaust steam will be cooled by closed-cycle recirculation of water obtained from and discharged to an 8375-acre cooling lake. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded to issue construction permits subject to the following conditions: (1) Submit design for intake structure from the Cape Fear River. (2) Proper disposal of morpholine or use of acceptable chemical. (3) Establish an ecological base line for measuring operational impact, and initiate program 2 yr prior to operation. (4) Collect one full year of meteorological data. (5) Maintain stipulated chlorine concentration levels. (Houser-ORNL)
W73-11926

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CRYSTAL RIVER UNIT 3.
Atomic Energy Commission, Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50302-75, $10.60 per copy, $1.45 microfiche. Docket 50302-75, May 1973. 403 p, 45 fig, 44 tab, 129 ref, 5 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Florida.
Identifiers: Environmental impact statements, *Pressurized water reactors, Crystal River (Fla).

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continuation of construction and issuance of an operating license for the Crystal River Unit No. 3. The site is on the Gulf of Mexico near Crystal River, Florida. It will employ a pressurized water reactor cooled by once-through water obtained from and discharged to the Gulf of Mexico. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to continue the construction permit and issue an operating license for the facility subject to the following conditions: (1) further study to reduce or eliminate impact of entrainment and discharge of heated water to the Gulf of Mexico; (2) further study of the cooling system, (3) definition of a monitoring program for operational impacts; (4) submittal of an analysis of operational problems and proposal of a course of action to alleviate the problem. (Houser-ORNL)
W73-11927

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF PILGRIM NUCLEAR POWER STATION.
Division of Radiological and Environmental Protection (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50293-70; $7.60 per copy, $1.45 microfiche. Docket 50293-70, May 1972. 182 p, 16 fig, 12 tab, 62 ref, 3 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Massachusetts, Lobsters, Mosses.
Identifiers: Environmental impact statement, *Boiling water reactors, *Cape Cod Bay (Mass).

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the operation of the Pil-

grim Nuclear Power Station, a boiling water reactor cooled by a once-through flow of salt water from Cape Cod Bay, Plymouth, Mass. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It is concluded that an operating license be issued subject to continuation of the environmental monitoring program for at least a five-year period after the station begins operation, and mitigation of any adverse effects found. (Houser-ORNL)
W73-11928

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF JOSEPH M. FARLEY NUCLEAR PLANT UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No 50348-50; $7.60 per copy, $1.45 microfiche. Dockets 50348-50 and 50364-42, June 1972. 255 p, 38 fig, 24 tab, 120 ref, 6 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, *Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Alabama.
Identifiers: Environmental impact statements, *Pressurized water reactors, Chattahoochee River.

This final environmental statement relates to the proposed construction of the Joseph M. Farley Nuclear Plant Units 1 and 2. The plant is located in Southeastern Alabama on the Chattahoochee River, east of Dothan, Alabama. The plant will employ two pressurized water reactors with a closed-cycle cooling system using mechanical-draft cooling towers. Make-up water will be taken from and discharged to the Chatahoochee River. Environmental impacts were accessed, and, after consideration of alternatives, an environmental benefit-cost summary was compiled. Some environmental factors considered include hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent air and water. The conclusion was to issue a construction permit for the facility subject to the following conditions: (1) define an acceptable environmental monitoring program to determine changes in the ecosystem due to plant operations; (2) collect weather data sufficient to determine fogging conditions; (3) obtain information to determine noise level of operations at the site boundary along highway 95; (4) install gauging equipment in the Chattahoochee River to record flow conditions and study impact of entrainment. (Houser-ORNL)
W73-11931

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF VERMONT YANKEE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket No 50271-88; $10.60 per copy, $1.45 microfiche. Docket 50271-88, July 1972. 348 p, 33 fig, 33 tab, 139 ref, 5 append.

Descriptors: *Nuclear powerplants, *Effluents, *Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Vermont, Connecticut River.
Identifiers: Environmental impact statements, *Boiling water reactors.

This final environmental statement relates to the issuance of an operating license for the Vermont Yankee Nuclear Power Corporation. The plant will use a single-unit boiling water reactor and is located on the Connecticut River near Vernon, Vermont. It will be cooled by a once-through flow of water pumped from and returned to Vernon Pond and also by means of mechanical draft cooling towers. Environmental impacts were assessed, and, after consideration of alternatives, an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to issue an operating license subject to the following conditions: (1) Restrict temperature rise in Vernon Pond for ecological concern. (2) Restrict total residual chlorine in the plant discharge. (3) Define an acceptable environmental monitoring program to determine changes in the ecosystems resulting from plant operations. (4) Provide an analysis and course of action for alleviating any harmful effects found as a result of the plant operations. (Houser-ORNL)
W73-11932

THE KINETICS OF SIMULTANEOUS GLUCOSE AND XYLOSE UTILIZATION BY RHODOTORULA RUBRA,
Alaska Univ., College. Inst. of Marine Science.
B. Robertson, D. F. Holleman, and D. K. Button.
In: Multiple Substrate Transport in Dilute Solution, D. K. Button, Ed. 1971, University of Alaska, Institute of Marine Science, Fairbanks. p 49-65. OWRR A-023-ALAS (2).

Descriptors: *Biochemistry, *Kinetics, *Carbohydrates, *Growth rates, *Absorption, Yeasts, Marine fungi, Plant growth, Metabolism, Nutrients.
Identifiers: *Glucose, *Xylose, Rhodotorula rubra.

Organisms growing heterotrophically in natural water systems are faced with a large array of particulate and dissolved carbon sources from which they must select a group that can be transported and metabolized. Transport capabilities of many organisms for carbon sources appear to be saturated at fluxes less than required for even moderate growth rates and single components range far below their Michaelis constants for growth; thus it appears that multiple simultaneous substrate incorporation is the rule for dilute carbon source accumulation. Concentrations of glucose and xylose are described during the carbohydrate limited steady state growth of the marine yeast Rhodotorula rubra when present both separately and simultaneously over a range of growth rates. Minimum substrate levels must be exceeded before reproduction can occur. The time course of continuous cultures containing both glucose and xylose over a range of growth rates is shown. Maximum growth rate on glucose is increased by the addition of xylose but steady state glucose is only slightly affected. These new high growth rates are characterized by increased substrate affinity. The addition of glucose reduces limiting xylose concentrations to about half the steady state values of xylose alone. (Jones-Wisconsin)
W73-11934

CHEMOSTASIS AND HOMEOSTASIS IN AQUATIC ECOSYSTEMS: PRINCIPLES OF WATER POLLUTION CONTROL,
Harvard Univ., Cambridge, Mass. Labs. of Applied Chemistry and Applied Biology.
W. Stumm, and E. Stumm-Zollinger.
In: Nonequilibrium Systems in Natural Water Chemistry, Symposium of the American Chemical Society, Division of Water, Air, and Waste Chemistry, February 24-25, 1970, Houston, Texas, p 1-29. 10 fig, 2 tab, 42 ref.

Descriptors: *Balance of nature, *Ecosystems, *Water pollution control, Energy, Waste treatment, Modeling, Water chemistry, Equilibrium, Photosynthesis, Respiration, Succession, Human population, Water quality, Eutrophication.
Identifiers: *Chemostasis, *Homeostasis, Ecosystem stability.

Pollution is equated with disturbance of ecological balance and loss of stability. The members of an ecosystem are interlocked by various feedback loops (homeostasis) and thus adapted to coexistence for mutual advantage; increased diversity makes the system less subject to perturbations and enhance its survival. Chemical and biological factors regulating the composition of natural waters are reviewed. Natural waters are systems open to their environment, and much of their chemistry depends on the kinetics of physical and chemical processes. If input is balanced by output, a steady state condition is attained and the system remains unchanged in time. Such a time-invariant condition of a chemical reaction system represents a convenient idealized model of a natural water system. Because various disturbances cause similar and predictable changes, water pollution control methods beyond waste treatment can be outlined. The stress imposed on the environment results primarily from the fact that Western civilization is dependent on high energy utilization, yet unlimited growth in energy dissipation is incompatible with maintenance of ecological stability. Ecological constraints demand alteration of human, social, and economic systems toward a stationary state in which resources and materials are recycled as much as possible. (Jones-Wisconsin)
W73-11935

A DYNAMIC MODEL OF THE PHYTOPLANKTON POPULATION IN THE SACRAMENTO--SAN JOAQUIN DELTA,
Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Programs.
D. M. Di Toro, D. J. O'Connor, and R. V. Thomann.
In: Nonequilibrium Systems in Natural Water Chemistry, Symposium of the American Chemical Society, Division of Water, Air, and Waste Chemistry, February 24-25, 1970, Houston, Texas, p 131-180. 12 fig, 7 tab, 67 ref.

Descriptors: *Water quality control, *Mathematical models, *Phytoplankton, *Eutrophication, California, Aquatic populations, Growth rates, Equations, Mortality, Respiration, Grazing, Zooplankton.
Identifiers: *Phytoplankton population model, Sacramento-San Joaquin Delta, Phytoplankton population kinetics, Lotka-Volterra equations.

A quantitative model of phytoplankton population dynamics in natural waters is introduced. Within this problem context, the simplifications, assumptions, and generally the structure of the model is formulated. The attempt was made to make the equations representative of the biological mechanisms while still retaining a sufficient simplicity so that the result is tractable and useful. The principle of conservation of mass is the basis upon which the mathematical development is structured. The form of the growth and death rates as functions of environmental parameters and de-

pendent variables is an important element in the phytoplankton population model. The equations are compared with two years' data from the tidal portion of the San Joaquin River, California. The agreement achieved between the available data and the model calculations prompts further effort in this direction. The resulting equations are admittedly complex and require numerical methods for solution. The initial application of these equations to an actual problem area with specific eutrophication problems has been sufficiently successful to support its engineering use as a preliminary step in the assessment of a potential or actual eutrophication problem. (Jones-Wisconsin)
W73-11937

CORRELATED LIGHT AND ELECTRON MICROSCOPE STUDIES ON BROWN ALGAE. I. LOCALIZATION OF ALGINIC ACID AND SULPHATED POLYSACCHARIDES IN DICTYOTA,
Leeds Univ. (England). Dept. of Plant Sciences.
L. V. Evans, and M. S. Holligan.
New Phytologist, Vol 71, No 6, p 1161-1172, 1972. 5 plates, 66 ref.

Descriptors: *Analytical techniques, *Microscopy, *Electron microscopy, *Phaeophyta, Cytological studies, Plant morphology.
Identifiers: *Alginic acid, *Sulphated polysaccharides, *Dictyota dichotoma, Fucoidan, Histochemistry, Light microscopy.

With information from chemical analyses of materials produced by brown algae, together with electron microscopy and light microscopic procedures, it was found that the cell walls of vegetative thallus and of mature reproductive cells (tetrasporangia, tetraspores, antheridia and oogonia) are composed of three to four well-defined layers, mainly of alginic acid, sulphated polysaccharide or a mixture of these. Prior to their secreation the two types of polysaccharide can generally be detected in conspicuous, peripheral, intracellular cytoplasmic vesicles. Alginic acid is liberated from vesicles through the plasma membrane by reversed pinocytosis. There is almost certainly some cellulose present also, although since alginic acid and cellulose are not yet distinguishable, the exact location of the cellulose is not clear. The origin of the alginic acid and sulphated polysaccharides has not been established. It is probable that one or more of these substances originate from Golgi complexes in thenuclear area where highly distended Golgi cisternae are commonly encountered. These results are discussed relative to other work on brown algal polysaccharides and histo-chemistry. Formation of extra-cellular material by peripheral vesicles, abundant in epidermal and apical cells but present also in medullary cells, oogonia and tetrasporangia, is also reported. (Jones-Wisconsin)
W73-11939

SEAWEEDS AS MANURE III. FIELD MANURIAL TRIALS ON PENNISETUM TYPHOIDS S. H. (PEARL MILLET) AND ARACHIS HYPOGEA (GROUNDNUT),
Central Salt and Marine Chemicals Research Inst., Bhavnagar (India).
K. K. Bokil, V. C. Mehta, and D. S. Datar.
Botanica Marina, Vol 15, No 3, p 148-150, 1972. 3 tab, 12 ref.

Descriptors: *Crop response, *Marine plants, *Fertilizers, *Evaluation, rhodophyta, Cereal crops, Oilseed crops, Semiarid climates, Organic matter, Forages.
Identifiers: *Seaweed manure, India, Pearl millet, Groundnut.

Application of seaweed manure as an auxilliary source of organic matter to two major crops, pearl millet and groundnut, and the crop response--either yield or quality--was evaluated in a semi-arid region at Bhavnagar, India. In experiments on pearl millet, effect of nitrogen applied as ammonium sulphate, sea weed manures, and farmyard manure was studied. On groundnut, nitrogen, phosphoric acid, sea weed and farmyard manures were applied. Average yield of grains and fodder of pearl millet and their nitrogen and phosphoric acid content show that both these constituents are favorably influenced by use of seaweed manure as compared to the effect of ammonium sulphate alone. Although the use of seaweed manure does not have significant influence over pearl millet yield, quality of its grains and fodder is favorably influenced. In data on average yield of groundnut pods and dry matter along with their quality attributes, it is observed that variation in yield of pods as well as dry matter, due to treatment differences, is insignificant. It is concluded that seaweed manure improves the quality attributes of crops and in some cases increases yields by enhancing utilization of nutrient elements applied in inorganic form. (Jones-Wisconsin)
W73-11941

PLANKTON DIATOM SPECIES BIOMASSES AND THE QUALITY OF AMERICAN RIVERS AND THE GREAT LAKES,
Alabama Univ., University. Dept. of Biology.
L. G. Williams.
Ecology, Vol 53, No 6, p 1038-1050, 1972. 5 fig, 1 tab, 18 ref.

Descriptors: *Plankton, *Diatoms, *Biomass, Water quality, Rivers, Great Lakes, Water analysis, Dominant organisms, Seasonal, Eutrophication, Analytical techniques, Algae, Sampling, Ecological distribution, Bioassay.

Diversity and dominance of diatom species for both the spring and fall population pulses are given for 128 stations on the Great Lakes and several major U. S. rivers. Possible relationships of various physical, chemical, and biotic parameters of water quality are suggested for immediate application to water pollution assessment and pollution abatement. Principal diatom species and their environmental conditions of temperature, dissolved oxygen, pH, and hardness for two years are tabulated. They appear to be related more to the edaphic factors of the drainage area than to known pollution; the diatom community structure appears to be a valid indication of the water quality of the stations investigated. The procedure used was selected to identify diatoms to species and to determine the biomass of each species with special methods for sample processing, counting techniques, data coding and reporting, and preservation as reported earlier. Biomass measurements of the total phytoplankton per liter and the biomass of each species of diatoms in 5 microliters of diatom biomass per sample are presented, comprising 54 semimonthly samples per station for 27 months, from October 1960 to January 1963. (Jones-Wisconsin)
W73-11942

THE LIGHT THRESHOLD CONTROLLING THE VERTICAL MIGRATION OF CHAOBORUS PUNCTIPENNIS IN A GEORGIA IMPOUNDMENT,
Georgia Univ., Athens. Dept. of Zoology.
I. Chaston.
Ecology, Vol 50, No 5, p 916-920, 1969.

Descriptors: *Diptera, *Light, *Vertical migration, *Insects, Georgia, Sediments, Seasonal, Diurnal, Light intensity, Larvae, Lentic environment.
Identifiers: *Chaoborus punctipennis, Nocturnal migration.

In most lentic situations, Chaoborus larvae are benthic during day and migrate into the water column at night. The light level at which the nocturnal migration of a lentic larva commences was measured by examining the light threshold for migration of the Chaoborus punctipennis larvae in a NE Georgia impoundment. To estimate the threshold, number of animals in each 15-minute interval sample and, above this, logarithm of light measured every 15 minutes were plotted against time. Mid-point between the last sample showing a low (or 'daytime') number of animals in water column and the first sample exhibiting a high (or 'nighttime') number, was taken as the start of nocturnal migration. By knowing the time nocturnal migration commenced, it was possible to take the light level at this point to be the observed field threshold for the evening's sample. Light threshold controlling migration from sediment into water column in the evening was 2.44 lux in winter, changing in spring, the seasonal change in light period affecting the animals. Laboratory experiments gave a mean threshold value of 7.44 lux, and showed the animals were most stimulated by light between 500 and 600 millimicrons. (Jones-Wisconsin)
W73-11943

ZOOPLANKTON COMPOSITION AND CHANGE IN AN ALPINE LAKE,
Calgary Univ. (Alberta). Dept. of Biology.
R. S. Anderson.
Verhandlungen der Internationalen Limnologie, Vol 18, p 264-268, 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Zooplankton, *Alpine, *Lakes, Canada, Fish stocking, Rotifers, Crustaceans, Daphnia, Copepods, Fish food organisms.
Identifiers: Banff National Park (Canada), Bighorn Lake (Canada), Pipit Lake (Canada), Snowflake Lake (Canada), Diaptomus tyrrelli, Cyclopoids.

Previously fish-free lakes in Banff National Park, Canada, containing Diaptomus articus and either Daphnia pulex or Daphnia middendorffiana, were stocked with hatchery-reared trout. These large species dominate zooplankton, and rotifers are usually scarce in alpine and subalpine lakes of this area. In Snowflake Lake, sampled for six years beginning in 1966 at intervals of 2 to 4 weeks throughout as much of each year as feasible, the last individuals of large crustacean species were collected. The apparent simplicity and stability of the zooplankton community provided a seemingly ideal situation for the life cycle study of Diaptomus tyrrelli. In subsequent years it became obvious that this community was neither simple nor stable. Scarcity of rotifers in the presence of certain copepods, abundance of rotifers after fish introduction, and subsequent elimination of copepods is supported by earlier findings. If no more fish are stocked in Snowflake Lake and present stocks continue to decline, Cyclops vernalis might increase and D. tyrrelli decrease numerically. On the other hand, if D. articus attains its former abundance either through reintroduction or a possible residium which have escaped fish predation, the zooplankton community could revert to its original character. (Jones-Wisconsin)
W73-11944

EFFECTS OF DEFORESTATION ON WATER QUALITY,
Cornell Univ., Ithaca, N.Y. Section of Ecology and Systematics.
For primary bibliographic entry see Field 04C.
W73-11945

EFFECT OF DIVERSION OF DOMESTIC WASTE WATERS ON PHOSPHORUS CONTENT AND EUTROPHICATION OF THE MADISON LAKES,
Wisconsin Univ., Madison. Water Chemistry Program.
W. C. Sonzogni, and G. F. Lee.
In: 73rd National Meeting, American Institute of Chemical Engineers, August 1972, Minneapolis,

Minnesota. (Preprint). 30 p. 6 fig, 2 tab, 34 ref. EPA 16010 EHR.

Descriptors: *Diversion, *Sewage effluents, *Phosphorus, *Eutrophication, Wisconsin, Lakes, Water quality, Mathematical models, Sewage treatment, Nitrogen, Nutrients, Nuisance algae, Water pollution control.
Identifiers: *Madison (Wis), Lake Waubesa (Wis), Lake Kegonsa (Wis), Lake Monona (Wis), Lake Wingra (Wis), Yahara River (Wis), Rock River (Wis), Receiving waters, Badfish Creek (Wis), Lake recovery.

The use of elementary mathematical relationships to determine the expected rate of recovery of excessively fertilized lakes after a reduction in the phosphorus input is discussed and a prediction of the effect of a recent waste water effluent diversion at headwaters of the Madison, Wisconsin, lakes is presented. Pertinent physical characteristics of the lakes are summarized. Earlier diversions and current sewage diversion areas are given, including a history of waste treatment and disposal with the effect of the earlier diversions. The most recent sewage diversion occurred in December 1971, when the waste waters from two small municipalities north and west of Madison were diverted from Lake Mendota. As part of a project aimed at modeling the aqueous environmental chemistry of nitrogen and phosphorus in Lake Mendota, amounts and forms of nitrogen and phosphorus as well as other parameters, are being determined at meter depth intervals in the lake each week. It is predicted that a new equilibrium phosphorus content will be reached in Lake Mendota in about 1975, or about three years after the reduction in the phosphorus influx resulting from the waste water diversion. (Jones-Wisconsin)
W73-11946

PHOTOSYNTHESIS BY ALGAL EPIPHYTES OF UTRICULARIA IN EVERGLADES NATIONAL PARK,
Indiana Univ., Bloomington. Dept. of Microbiology.
T. D. Brock.
Bulletin of Marine Science, Vol 20, No 4, p 952-956, 1970. 1 fig, 1 tab, 3 ref.

Descriptors: *Aquatic plants, *Photosynthesis, *Algae, Florida, Primary productivity, Chlorophyll, Carbon cycle.
Identifiers: *Epiphytic algae, *Utricularia, *Everglades National Park (Fla).

Studies on photosynthesis, as measured by the C-14 method, in Utricularia and its associated algal epiphytes are described. During some observations in the Shark River system of Everglades National Park, it was observed that new shoots of the macrophytes, Utricularia purpurea and U. lutea, were bright green, whereas older shoots were a dull brown color. The color of the latter shoots was due primarily to a heavy population of epiphytic diatoms, desmids, and blue-green algae. Photosynthesis measured on epiphyte-free and epiphyte-containing fronds and the chlorophyll content and epiphyte content were estimated simultaneously. Processing involved homogenization, filtration of aliquots for C-14 counting, and extraction of aliquots for chlorophyll. Epiphyte content was estimated visually and microscopically on the homogenate samples. The results provide evidence that the rate of photosynthesis is much greater in epiphyte-laden Utricularia than in epiphyte-free plants, which leads to the suggestion that the epiphytes, rather than the macrophytes, are responsible for most of the primary production in this aquatic ecosystem. (Jones-Wisconsin)
W73-11947

EVIDENCE FOR TWO LIGHT-DRIVEN REACTIONS IN THE PURPLE PHOTOSYNTHETIC BACTERIUM, RHODOSPIRILLUM RUBRUM,
Illinois Univ., Urbana. Dept. of Physiology and Biophysics.
C. Sybesma, and C. F. Fowler.
Proceedings of the National Academy of Sciences, Vol 61, No 4, p 1343-1348, 1968. 3 fig, 25 ref.

Descriptors: *Biochemistry, *Photosynthesis, *Bacteria, Light intensity, Pigments, Light, Photoactivation.
Identifiers: *Rhodospirillum rubrum, Chloropseudomonas ethylicum, Cytochromes, Bacteriophyll, Light reactions.

Kinetic and spectral separation of light-induced oxidation of C428 and cytochrome c2 in Rhodospirillum rubrum, using moderate intensities of actinic light, under strict anaerobic conditions with cell suspension depleted of substrate, are reported. This separation allowed measurement of action spectra of light-induced oxidation of each cytochrome. Apparent difference between the action spectra resulting from such measurements indicated that each of the cytochromes is involved in a separate light reaction. Measurements of light-induced absorbance changes were made with a 'split-beam' absorption difference spectrophotometer. The kinetic pattern of light-induced absorbance changes in R. rubrum in the spectral region between 400 and 600 nm is largely dependent on the intensity of the actinic light. Although the action spectra still allow a trivial interpretation in which the photosynthetic pigment system contains two regions in which the light-harvesting pigments B890 (bulk of bacteriochlorophyll) and P800 (the minor component responsible for the absorption band at 804 nm) are present in different ratios, the simplest explanation of the present data involves two different light-driven reactions. One light reaction involves the oxidation of a pigment, C428, presumably a cytochrome. The second light reaction involves the oxidation of cytochrome c2. (Jones-Wisconsin)
W73-11948

SEASONAL DISTRIBUTION OF CHONDROCOCCUS COLUMNARIS INFECTION IN RIVER FISHES AS DETERMINED BY SPECIFIC AGGLUTININS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
M. P. Fujihara, and F. P. Hungate.
J Fish Res Board Can. Vol 29, No 2, p 173-178, 1972. Illus.
Identifiers: Agglutinins, *Chondrococcus-columnaris, Columbia River, Distribution pattern, Infection, Prosopium-williamsoni, Rivers, Seasonal, Snake River, *Washington, Whitefish, *Fish populations.

River fish populations (in Washington) infected with C. columnaris disease were surveyed by measurements of C. columnaris agglutinating antibodies in blood sera of fishes and by isolation of the pathogen using microbiological plating methods. Agglutinins were demonstrated in all 13 fish species collected except whitefish (Prosopium williamsoni). Blood serum from samples of fishes at 4 Columbia River sites during 1965 and 3 Columbia River sites and 1 Snake River site during 1969-70 demonstrated single annual cycles of C. columnaris antibody production. During the 2 annual sampling periods, the magnitude of antibody titers and frequency of fish with agglutinins increased in warm water and declined in cool water. The rise in titers occurred after a winter low, and usually followed the period when the first C. columnaris organisms were isolated from native fish. Agglutinating titers up to 1:5000 were found but most peak titers were between 1:320 and 1:640.—Copyright 1972, Biological Abstracts, Inc.
W73-11949

INFLUENCE OF DILUTION, SINKING AND GRAZING RATE ON PHYTOPLANKTON POPULATIONS OF HYPERFERTILIZED PONDS AND MICROECOSYSTEMS,
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
D. Uhlmann.
Mitteilungen Internationale Vereinigung Limnologie, Vol 19, p 100-124, 1971. 13 fig, 2 tab, 37 ref.

Descriptors: *Phytoplankton, *Nutrients, *Growth rates, *Eutrophication, Light, Biomass, Equations, Sewage lagoons, Chlorella, Scenedesmus, Biological communities, Daphnia, Productivity, Mathematical studies.
Identifiers: *Change of biomass, Cropping factors.

An overall-rate-of-change equation of phytoplankton biomass is proposed, in which gains are represented by importation and growth, losses by dilution, grazing and sedimentation. All rate-constants are assumed to be proportional to biomass concentration of phytoplankton. This is evident for dilution from theoretical considerations and for sedimentation from experimental results. In standing water, with decreasing nutrient load, genera with high saturation constants for phosphate uptake (Saprophytic bacteria, Chlorophyta) apparently become substituted by forms with lower saturation constants (Chrysophyta, Cyanophyta, Pyrrhophyta). On the laboratory scale, aquaria vessels of 4 or 16 liter capacity were operated singly or in series on a modified fill and draw basis as semicontinuous-flow models of sewage ponds. Given a certain dilution rate, computation not only of growth rate, but also of sinking rate and grazing rate in this steady-state situation was possible by means of simple arithmetic equations. The biomass concentration of phytoplankton remained fairly constant when dilution rate was stepwise increased from 0.025 to 0.2. In a two-stage semicontinous-flow model, with growth of Chlorella in the first and of Daphnia in the second stage, outwash of Daphnia occurred at a dilution rate of more than 0.3. (Jones-Wisconsin)
W73-11950

NET PLANKTON AND NANOPLANKTON PRODUCTION AND BIOMASS IN A NORTH TEMPERATE ZONE LAKE,
McGill Univ., Montreal (Quebec). Dept. of Biology.
J. Kalff.
Limnology and Oceanography, Vol 17, No 5, p 712-720, 1972. 6 fig, 1 tab, 32 ref.

Descriptors: *Plankton, *Nanoplankton, *Primary productivity, *Biomass, Lakes, Temperate, Eutrophication, Epilimnion, Cyanophyta, Diatoms, Stratification, Canada, Photosynthesis.
Identifiers: *Lac Hertel (Quebec).

The fractions of the primary production contributed by the nanoplankton in Lac Hertel, a small naturally eutrophic lake in Quebec, are determined. The present degree of eutrophication was reached virtually without man's direct influence. Allochthonous organic matter in the form of deciduous leaves and dissolved organic matter enter the lake through the brooks, runoff, or by wind action. Generally oligotrophic lakes have a planktonic flora containing a high proportion of nanoplankton while eutrophic waters have a standing crop much more dominated by the net plankton, although the proportions are highly variable. This study shows that even at times when the net plankton were very conspicuous the nanoplankton were responsible for much of the photosynthate produced. Selective filtration showed that on an annual integrated basis between 75 and 79% of production in 1966 and 1967 was synthesized by the nanoplankton. In 1967 the net plankton contributed more than half of the recorded epilimnetic biomass on one occasion but never more than half

the daily production. The conspicuous blue-green alga-diatom complex that characterized the lake during stratification was photosynthetically inefficient as compared to the nanoplankton. (Jones-Wisconsin)
W73-11951

ALKALINE PHOSPHATASE ACTIVITY IN THE TROPICAL MARINE BLUE-GREEN ALGA, OSCILLATORIA ERYTHRAEA ('-TRICHODESMIUM'),
Massachusetts Univ., Gloucester. Marine Station; and Nova Univ., Dania, Fla. Physical Oceanographic Lab.
C. M. Yentsch, C. S. Yentsch, and J. P. Perras.
Limnology and Oceanography, Vol 17, No 5, p 772-774, 1972. 1 tab, 5 ref.

Descriptors: *Nutrient requirements, *Marine algae, *Cyanophyta, Florida, Phosphates, Nitrogen fixation, Enzymes, Metabolism, Hydrogen ion concentration.
Identifiers: *Alkaline phosphatase, *Oscillatoria erythraea.

Oscillatoria erythraea, widespread in low-nutrient tropical waters, is able to maintain its nitrogen requirement by nitrogen fixation and its phosphorus requirement by the production of alkaline phosphatases, enzymes which enable the organisms to remove the inorganic phosphate radical from organically bound phosphate. The significance of the presence of phosphatase in natural populations is that the algae have overcome growth limitation by inorganic phosphate by having the capacity to metabolize organic phosphates. The activity of this enzyme in Oscillatoria erythraea was investigated. Alkaline phosphatase activity was found to be operating at the time of collection at nutrient levels of inorganic phosphate between 0.11 and 0.34 microgram-atom/liter. Alkaline phosphatase activity was not demonstrated in phytoplankton collected from coastal waters, where nutrient levels are much higher. Insufficient inorganic phosphate in the water surrounding the cells results in induction or activation of the enzyme, or both. The phosphatase action, along with its ability for nitrogen fixation, provides a mechanism for the survival of this organism in the low-nutrient waters in which it is found. (Jones-Wisconsin)
W73-11952

EFFECT OF CLAY ON THE AVAILABILITY OF DILUTE ORGANIC NUTRIENTS TO STEADY--STATE HETEROTROPHIC POPULATIONS,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button.
Limnology and Oceanography, Vol 14, No 1, p 95-100, 1969. 5 fig, 10 ref.

Descriptors: *Clays, *Nutrients, *Organic matter, *Microorganisms, Suspended solids, Bentonite, Yeasts, Vitamin B, Biochemistry, Adsorption, Alaska, Hydrogen ion concentration, Phosphates, Sediments.
Identifiers: Glucose.

Chemical analyses of certain systems have been interpreted to show that clays and sediments are effective in adsorbing organic compounds from solution. Amount of adsorption determines the effect of clays on the dissolved organic chemistry of sediment-laden water systems. This effect on availability of small organic molecules to microorganisms was determined. Changes in available substrate concentration can be determined by observing changes in steady-state concentration of organisms at a particular rate. Since a low binding constant for the clay-thiamine association was indicated, binding ability of clay was further tested with the carbon source--glucose. Recovered suspended sedimentary material and Bentonite were tested for their ability to compete with yeast and bacteria for thiamine or glucose in continuous culture systems at low organism concentrations. The added clays do not render the organics tested unavailable to microorganisms or remove them from solution to a detectable or significant extent. The addition of clays can, however, effect a perturbation to the steady system, possibly by altering the inorganic chemistry of the dissolved phase. It seems unlikely that in natural systems the level of suspended organisms using small organic molecules is materially influenced by the level of suspended sedimentary material. (Jones-Wisconsin)
W73-11954

PRESERVING THE GREAT LAKES,
Resources Development Consultants, Inc. Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W73-11955

SOME FACTORS INFLUENCING KINETIC CONSTANTS FOR MICROBIAL GROWTH IN DILUTE SOLUTION,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button.
In: Proceedings of Symposium on Organic Matter in Natural Waters, University of Alaska, Fairbanks Institute of Marine Science Occasional Publication No. 1, 1970. p 537-547, 5 fig, 6 ref. OWRR A-023-ALAS (3).

Descriptors: *Biochemistry, *Kinetics, *Growth rates, *Microorganisms, Nutrients, Diffusion, Mixing, Temperature, Hydrogen ion concentration, Heavy metals, Yeasts, Vitamin B, Equations, Mathematical studies, Copper.
Identifiers: Cryptococcus albidus, Cryptococcus utilis.

Growth velocity is normally an increasing function of limiting substrate concentrations. The means by which growth velocity of a yeast cell Cryptococcus albidus varies with the vitamin thiamine at the cell surface is shown. Where growth rate is limited at the cell surface by nutrient transport the system can be likened to substrate competition for passage through a matrix of doors. These doors at the cell surface are chemical in nature and subject to closing (chemical modification) by inhibitory components of the medium. Long term substrate limited growth at low population can respond to concentration in a different way than short term substrate uptake. A higher heavy metal tolerance at the expense of a less efficient transport system which lowers the total standing crop at a given level of nutrients is indicated. Thus, with addition of copper the rate of growth of Rhodotorula glutinis, a marine pink yeast, was sharply reduced. Mixing, temperature, nutrient concentration and inhibitor concentration all affect the efficiency and rate at which microbial processes occur and effects can be described in a rational manner. (Jones-Wisconsin)
W73-11956

OCCURRENCE, DISTRIBUTION AND DENSITY OF RANGIA CUNEATA IN LAKES PONTCHARTRAIN AND MAUREPAS, LOUISIANA,
Louisiana Wild Life and Fisheries Commission, New Orleans.
J. W. Tarver.
Available from the National Technical Information Service as COM-73-10026, $3.00 in paper copy, $0.95 in microfiche. Technical Bulletin No. 1, 1972. 8 p. 2 fig, 1 tab, 18 ref.

Descriptors: *Population, *Clams, *Distribution, *Density, Louisiana, Size, Brackish water.
Identifiers: *Rangia cuneata, *Lake Pontchartrain (La), *Lake Maurepas (La).

Dead clam shells worth several million dollars are harvested from Lakes Pontchartrain and Maurepas, Louisiana, annually. A determination was made of the present occurrence, abundance, and size distribution of Rangia cuneata in these lakes. Benthic samples were taken throughout the lakes from 15 selected areas on a monthly basis, and additional random samples were taken during the study period from November 1, 1969 through November 31, 1970. Depth, bottom type, salinity, and temperature were recorded with each sample. The data indicate that Rangia populations in Lakes Pontchartrain and Maurepas were stable with no major fluctuations occurring during the sample period. Very few clams were collected from hard, sand-bottomed areas. Though all the monthly stations indicated that the Rangia mean height varied from month to month, the populations were stable, having no major fluctuations in mean height during the study. The presence of low salinity, high turbidity, and a substrata of sand, mud and vegetation remnants during the sample period seems to have resulted in a high clam density, and consequently, a small clam size. (Jones-Wisconsin)
W73-11957

EFFECTS OF ARTIFICIAL AERATION ON THE CHEMISTRY AND ALGAE OF TWO MICHIGAN LAKES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Fast, B. Moss, and R. G. Wetzel.
Available from the National Technical Information Service as COO159950, $3.00 in paper copy, $1.45 in microfiche. (1972) 57 p. 18 fig, 29 ref. EPA 16010 EXE.

Descriptors: *Water treatment, *Aeration, *Lakes, Destratification, Michigan, Biota, Water chemistry, Hypolimnion, Thermal stratification, Phytoplankton, Primary productivity, Mixing, Alkalinity, Oxygen, Turbidity, Temperature, Hydrogen ion concentration, Foaming, Cycling nutrients, Algae.
Identifiers: *Compressed air, Section Four Lake (Mich), Hemlock Lake (Mich).

Using compressed air, an unproductive hard water lake was destratified, and a eutrophic lake had its hypolimnion aerated while thermal stratification was maintained. Both lakes were studied during 1969 as a control period, and aerated during 1970. Aeration effects on the biota and on some chemical factors were measured. Hemlock and Section Four Lakes, in Pigeon River State Forest, near the Straits of Mackinaw, Michigan, are lime sink lakes; Section Four is a typical unproductive marl lake, while Hemlock is an atypical marl lake, being both productive and meromictic. Although it has high alkalinity, with marl deposits in shallow water, these sediments are covered with a thick layer of peaty organic material that originated mostly from the bordering forest and marsh. Chemical and algal changes in Section Four Lake during destratification were not great. Although phytoplanktonic production potentials increased during mixing, phytoplankton standing crop appeared to decline slightly, possibly due to increased mixing depth and turbidity. Hemlock Lake hypolimnetic anoxia and associated conditions were eliminated during aeration. The lake gradually destratified during aeration due to leaks in the aeration tower which released nutrient-rich water into the epilimnion, pormoting algal growth. (Jones-Wisconsin)
W73-11958

EXPOSURE TIMES NECESSARY FOR ANTIMYCIN AND ROTENONE TO ELIMINATE CERTAIN FRESHWATER FISH,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
P. A. Gilderhus.
J Fish Res Board Can. Vol 29, No 2, p 199-202. 1972.
Identifiers: *Antimycin, Bullhead, Exposure, Fish, *Rotenone, Times, *Fish mortality.

In laboratory flowing-water troughs exposure required to induce 100% mortality, regardless of time to death for antimycin and rotenone against selected freshwater fish species was determined. Carp and white suckers required shorter exposures to antimycin (6 hr) than to rotenone (18-24 hr) at field-use concentrations of 5 and 50 ppb, respectively. Bullheazds were killed by 3-10 hr exposure to 100-250 ppb rotenone at 17 C or higher. However, the long exposure time necessary in colder water (25 hr at 100 ppb in 12 C water) made elimination of bullheads with rotenone difficult in cold seasons. Exposure time was influenced more by water temperature than by the toxicant concentration. The effects of rotenone were often reversible even after fish had been on their sides in the toxicant solution for 4-5 hr but irreversible for antimycin after fish showed the first signs of distress.–Copyright 1972, Biological Abstracts, Inc.
W73-11961

DECOMPOSITION OF DISSOLVED ORGANIC CARBON AND NITROGEN COMPOUNDS FROM LEAVES IN AN EXPERIMENTAL HARDWATER STREAM,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel, and B. A. Manny.
14 P, 3 FIG, 21 REF. (1972) AEC AT (11-1)-1599, NSF GB-28900X.

Descriptors: *Decomposing organic matter, *Dissolved organic matter, *Carbon, Nitrogen compounds, Leaves, Streams, Hardness (Water), Bacteria, Organic matter, Microbial degradation, Cycling nutrients.

Bacterial decomposition rates of labile and refractory components of dissolved organic carbon and nitrogen compounds in natural leaf leachate are interpreted in relation to their importance in the metabolism of lakes receiving residual organic compounds from streams. Evidence is presented that dissolved organic matter flux in streams is controlled heterotrophically by bacterial utilization rates of organic compounds as is the case in lake metabolism. Addition of dry hickory and maple leaves, for 30 hours in laboratory recirculating streams permitted detailed examination of leaf leachate impact on the general structure and function of the stream ecosystem, closely simulating natural hardwaters woodland streams. Total dissolved organic carbon concentrations of the filtrates were measured and total dissolved organic nitrogen was fractionated into labile and refractory components by ultraviolet combustion and spectrophotometric analyses. Bacterial populations developed and decomposed labile dissolved organic carbon and nitrogen compounds from leaf leachate within 72 hours and then rapidly became carbon limited. Refractory organic nitrogen compounds persisted unmodified over 24 days. The processing capacity of woodland streams for natural dissolved organic compounds is much greater than previously believed but may be less effective for dissolved organic effluents of human origin. (Jones-Wisconsin)
W73-11962

THE PROBLEM OF PHOSPHORUS IN NEW YORK'S WATERS.
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05G.
W73-12012

ENTOMOLOGICAL SPECIAL STUDY NO. 44--013-72/73, LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYETHYLENE FORMULATIONS OF CHLORPYRIFOS, DECEMBER 1971-APRIL 1972,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05F.
W73-12042

TESTS OF RHODAMINE WT DYE FOR TOXICITY TO OYSTERS AND FISH,
Geological Survey, Tacoma, Wash.
G. G. Parker Jr.
Journal of Research, U. S. Geological Survey, Vol 1, No 4, p 499, July-August 1973. 1 ref.

Descriptors: *Toxicity, *Dye releases, *Flourescent dye, Oysters, Fish, Salmon, Trout.
Identifiers: *Rhodamine WT.

Because of the toxicity of rhodamine B dye in concentrations greater than 1 mg/liter to oyster larvae an d eggs in earlier tests there is some concern that rhodamine WT, a similar tracer dye, would have a detrimental effect on marine life. Exposures for 48 hours at 24C of oyster eggs and 12-day-old larvae in seawater with concentrations of rhodamine WT, ranging from 1 microgram/liter to 10 mg/liter, resulted in development of the eggs to normal larvae and no abnormalities in the larvae development. Tests made on the smolt of both silver salmon and Donaldson trout, with the fish held for 17.5 hours in a tank full of seawater with a dye concentration of 10 mg/liter at 22C, showed no mortalities or respiratory problems. With the concentration increased to 375 mg/liter, and the time extended an additional 3.2 hours, still no mortalities or abnormalities were noted. The fish remained healthy in dye-free water when last checked a month after the test. (Knapp-USGS)
W73-12068

STUDIES ON FRESHWATER MICRO-ORGANISMS: PHOSPHATASE ACTIVITY IN LAKES OF DIFFERING DEGREES OF EUTROPHICATION,
Freshwater Biological Association, Windermere (England).
J. G. Jones.
Journal of Ecology, Vol 60, No 3, p 777-791, November 1972. 10 fig, 2 tab, 23 ref.

Descriptors: *Biomass, *Eutrophication, *Lakes, *Aquatic microorganisms, *Epilimnion, *Hypolimnion, Artificial substrates, Dinoflagellates, Diatoms, Phosphorus, Bioindicators, Enzymes, Trophic level, Nutrients, Pyrrophyta, Protozoa, Water sampling, Biological properties, Chemical properties, Chemical analysis, Assay, Aquatic bacteria, Aquatic algae, Lake morphometry, Cultures, Phosphates, Dissolved oxygen, Cyanophyta, Chrysophyta.
Identifiers: *Alkaline phosphatase, *Enzyme activity, p-Nitrophenol phosphate, Chlorophyll a, Heterotrophic bacteria, Substrate utilization, Ceratium, Sample preparation, Organic phosphorus, Lake Westwater, Lake Ennerdale, LAKE Buttermere, Lake Crummock, Lake Coniston, Lake Thirlmere, Lake Windermere, Lake Ullswater, Lake Derwentwater, Lake Bassenthwaite, Lake Loweswater, Lake Rydal Water, Lake Grasmere, Lake Esthwaite Water, Lake Blelham Torn, Microcystis, Asterionella, Pseudoanabaena.

Sixteen lakes in the English Lake District were examined during the period of thermal stratification. Epilimnetic samples were analyzed for total phosphorus, total soluble phosphorus and soluble inorganic phosphorus (P sub i) concentrations, chlorophyll a, viable bacteria and alkaline phosphatase activity. Temperature and dissolved oxygen readings enabled the position of the thermocline to be determined and the degree of hypolimnetic oxygen deficit to be assessed. The lakes were placed in a series in order of increasing degree of eutrophication. Total phosphorus and chlorophyll a concentrations, bacterial numbers, hypolimnetic oxygen deficit and phosphatase activity measurements appeared to fit this series and so supported this classification which was based mainly on that of Pearsall (1921). Two methods were used to assess phosphatase activity, one based on the use of an artificial substrate, p-nitrophenol phosphate (PNP-PO4) and the other on the natural release of P sub i in stored water samples. Both methods produced results which were significantly correlated with total phosphorus levels of the water samples and also with microbial biomass. Repression and/or inhibition of alkaline phosphatase in relation to phosphorus levels found in the lakes was not satisfactorily demonstrated, but the variety of factors affecting these two control mechanisms (particularly inhibition) is such that a more detailed survey of each water body would be required. The high degree of correlation between the two variables indicated that the enzyme was a good indicator of biomass present and degree of eutrophication, except in samples where very high numbers of the dinoflagellate Ceratium sp. were present. The organism was found to contain significantly lower levels of the enzyme than those found in other micro-organisms. (Holoman-Battelle)
W73-12089

LOCATION AND CONSEQUENCES OF 1,1,1--TRICHLORO-2,2-BIS (P-CHLOROPHENYL) ETHANE UPTAKE BY BACILLUS MEGATERIUM,
Michigan State Univ., East Lansing. Dept. of Microbiology and Public Health.
For primary bibliographic entry see Field 05B.
W73-12091

RESISTANCE TO COLIPHAGE INFECTION INDUCED IN ESCHERICHIA COLI BY GROWTH IN THE PRESENCE OF A SURFACTANT,
California State Univ., Los Angeles. Dept. of Microbiology and Public Health.
I. H. Koransky, and D. A. Anderson.

Descriptors: *Surfactants, *E. coli, *Slime, *Adsorption, Cultures, Bioassay, Water pollution effects, Inhibitors, Infection, Bacteriophage.
Identifiers: *Coliphage, Sodium dodecyl benzene sulfonate, DNA.

To test the hypothesis that slime formation induced by surfactants may inhibit phage adsorption, strains of E. coli were streaked on nutrient agar containing sodium dodecyl benzene sulfonate (NaDDBS) and seeded with droplets of representative T-even and T-odd phage strains. The results suggest that the surfactant induced slime may mechanically block phage receptor sites, inhibiting phage adsorption. The major blocking agent may well be deoxyribonucleic acid, as indicated by the high viscosity and induction of phage adsorption and replication after treatment with deoxyribonuclease. (Little-Battelle)
W73-12105

THE TOXICITY OF HEAVY METALS TO EMBRYOS OF THE AMERICAN OYSTER CRASSOSTREA VIRGINICA,
National Marine Fisheries Service, Milford, Conn. Biological Lab.
A. Calabrese, R. S. Collier, D. A. Nelson, and J. R. MacInnes.
Marine Biology, Vol 18, No 3, p 162-166, February 1973. 2 tab, 28 ref.

Descriptors: *Heavy metals, *Embryonic growth stage, *Toxicity, *Bioassay, Mollusks, Lethal limit, Water pollution effects, Mortality, *Oysters, Invertebrates, Aluminum, Cadmium, Copper, Chromium, Lead, Manganese, Mercury, Nickel, Zinc, Laboratory tests, Larval growth stage, Larvae, Pollutants.
Identifiers: American oyster, *Crassostrea virginica, Median tolerance limit, Eastern oyster, Silver, Pelecypods, Arsenic.

The acute toxicity of 11 heavy metals tested as inorganic metallic salts to embryos of the American oyster Crassostrea virginica was studied and the concentrations at which 50 percent of the embryos did not develop were determined. Static tests were conducted throughout the study and all tests were

initiated within one hour after the eggs of the oyster were fertilized. Tests were terminated after 42 to 48 h. To determine the effect of metal toxicity on embryonic development, the embryos that survived and developed into larvae in each culture were collected on a 36-micron nylon screen, resuspended in a 250-ml graduated cylinder and, after thorough stirring to insure uniform distribution of the larvae, a 4-ml quantitative sample was removed and preserved in 5 percent neutral formalin. The samples were examined under a compound microscope and the number of embryos that had survived and developed into larvae was counted. The most toxic metals and their LC sub 50 values were mercury (0.0056 ppm), silver (0.0058 ppm), copper (0.103 ppm) and zinc (0.31 ppm). Those metals that were not as toxic and their LC sub 50 values were nickel (1.18 ppm), lead (2.45 ppm) and cadmium (3.80 ppm). Those metals that were relatively non-toxic and their LC sub 50 values were arsenic (7.5 ppm), chromium (10.3 ppm) and manganese (16.0 ppm). Aluminum was non-toxic at 7.5 ppm, the highest concentration tested. (Holoman-Battelle)
W73-12113

TOXICITY STUDIES ON THE COMPONENTS OF AN OIL-SPILL EMULSIFIER USING LICHINA PYGMAEA AND XANTHORIA PARIETINA,
Bristol Univ. (England). Dept. of Botany.
D. H. Brown.
Marine Biology, Vol 18, No 4, p 291-297, February 1973. 2 fig, 3 tab, 12 ref.

Descriptors: *Bioassay, *Chlorophyta, *Cyanophyta, *Lichens, *Photosynthesis, *Toxicity, *Plant pigments, *Surfactants, Emulsifiers, Inhibition, Water pollution effects, Radioactivity effects, Radioactivity techniques, Separation techniques, Plant physiology.
Identifiers: *BP 1002, *Oil-spill emulsifiers, *Lysis, Lichina pygmaea, Xanthoria parietina, Chlorella pyrenoidosa, Anabaena cylindrica, Organic solvents.

The response of the lichens Lichina pygmaea and Xanthoria parietina to components of the emulsifier BP 1002 was studied, and comparison made to the behavior of the free-living green alga chlorella pyrenoidosa and the blue-green alga Anabaena cylindrica. Inhibition of photosynthetic C-14-fixation by the emulsifier solvent alone was observed with both lichens. No alteration of the pattern of C-14 recovery in the various fractions was observed. Following treatment with either surfactant, total C-14-fixation was strongly inhibited; increased recovery of C-14 kin the solution fraction occurred, mainly at the expense of the alcohol-extract fraction. Surfactant B was more active in this respect than Surfactant A, and its effect was attributed to induced leakiness of the algal cell membranes. Photosynthesis of C. pyrenoidosa and A. cylindrica was inhibited totally by 1 percent emulsifier, and the latter alga lysed rapidly with 90 percent loss of the C-14 fixed. Observations on pigment loss showed removal of the extra-cellular pigment parietin from X. parietina by the solvent to be slightly enhanced by addition of either surfactant. L. pygmaea was unaffected by the solvent; both surfactants caused loss of lipid-soluble photosynthetic pigments, but only Surfactant B induced loss of an unknown water-soluble pigment. (Little-Battelle)
W73-12115

THE EFFECTS OF AMMONIUM AND PHOSPHATE ENRICHMENTS ON CHLOROPHYLL A, PIGMENT RATIO AND SPECIES COMPOSITION OF PHYTOPLANKTON OF VINEYARD SOUND,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
S. Vince, and I. Valiela.
Marine Biology, Vol 19, No 1, p 69-73, March 1973. 3 fig, 2 tab, 14 ref.

Descriptors: *Diatoms, *Limiting factors, *Phosphates, *Plant pigments, *Growth rates, Phytoplankton, Nutrients, Bioassay, Nitrogen.
Identifiers: *Chlorophyll a, *Ammonium, Asterionella japonica, Skeletonema costata, Chaetoceros spp, Vineyard Sound, Enrichment.

Seawater containing natural phytoplankton populations (dominant species: Asterionella japonica, Skeletonema costata, and Chaetoceros spp.) from Vineyard Sound, was enriched in the laboratory with three levels each of ammonium and phosphate and with a combination of ammonium and phosphate which provided three different N:P ratios. The addition of ammonium produced more cells and chlorophyll a than the control or the phosphate enrichments. However, enrichment with ammonium and phosphate, regardless of the N:P ratio, yielded the most cells and chlorophyll a. Thus, nitrogen seems to be the primary limiting nutrient, with phosphate showing secondary limiting effects. The ratios of photosynthetic pigments D430/D663 decreased with the increased chlorophyll a production in the enriched cultures. There were no significant changes in the species composition within the cultures, so that the observed changes in pigment ratio and chlorophyll a content were due to physiological responses. (Little-Battelle)
W73-12116

THE EFFECTS OF CHLORINATION OF WASTEWATER ON FERTILIZATION IN SOME MARINE INVERTEBRATES,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
D. Muchmore, and D. Epel.
Marine Biology, Vol 19, No 2, p 93-95, March 1973. 2 tab, 8 ref.

Descriptors: *Chlorination, *Fertilization, *Worms, *Annelids, *Bioassay, Toxicity, Invertebrates, Chlorine, Sewage treatment, Reproduction, Productivity, Marine animals, Water pollution effects, Domestic wastes, Sewage, Sea water, Fecundity.
Identifiers: *Sea urchins, Strongylocentrotus purpuratus, Urechis caupo, Phragmatopoma californica, Macroinvertebrates, Survival, Echinoderms, Echiuroids.

Gametes were collected from the sea urchin, Strongylocentrotus purpuratus, the echiuroid, Urechis caupo, and the annelid, Phragmatopoma californica, for studies on the effect of chlorination of domestic sewage on fertilization. Two hundred eggs were used in each sample with sperm concentrations of 0.033, 0.010, and 0.003 percent. In controls, fertilization always exceeded 98 percent. Fresh chlorinated and unchlorinated sewage from the Pacific Grove, California sewage treatment facility was used in the tests. Unchlorinated domestic sewage was a relatively weak inhibitor of external fertilization in the 3 marine invertebrates. Chlorinated sewage was a potent spermicide, active in inhibiting fertilization in concentrations of available chlorine as low as 0.05 ppm. Sodium hypochlorite in seawater duplicated the effect, and excess sodium thiosulfate terminated it. The possibility of chlorine disinfection affecting reproductive success in the vicinity of outfalls is discussed. (Little-Battelle)
W73-12117

EFFECT OF ZINC ON GROWTH AND DEVELOPMENT OF LARVAE OF THE PACIFIC OYSTER CRASSOSTREA GIGAS,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
A. Brereton, H. Lord, I. Thornton, and J. S. Webb.
Marine Biology, Vol 19, No 2, p 96-101, March 1973. 4 fig, 1 tab, 14 ref.

Descriptors: *Bioassay, *Growth rates, *Zinc, *Mortality, Larvae, *Oysters, Heavy metals, Reproduction, Toxicity, Productivity, Water pollution effects, Fecundity, Animal physisology, Marine animals, Animal pathology.
Identifiers: *Crassostrea gigas, *Teratogenicity, Macroinvertebrates, Zinc sulfate, England, North Wales, Teratogens, Pacific Oyster.

Following the observation of periodic high concentrations of zinc in estuarine waters used in the White Fish Authority's oyster hatchery at Conway, North Wales, two beaker trails were conducted to study the effect of zinc, over the range recorded, on the young stages of larvae of Crassostrea gigas. Zinc, added to sea water both as zinc sulfate and as a natural mine-adit water, was applied for a period of 5 days, after which larvae were maintained for a further 5 days in sea water alone. Increasing concentrations over the range 125 to 500 ppb Zn resulted in decreasing growth and increasing incidence of abnormality and larval mortality. A second trial with zinc sulfate showed 50 ppb Zn to have little effect on larval development, a progressive decrease in growth at 100 and 150 ppb, and no growth at 200 ppb. It is suggested that the deleterious effect of short-term exposure to zinc may well have contributed to the intermittent failure of larvae and irregular productivity recorded at the hatchery. It is also possible that zinc contamination in estuaries may affect natural oyster breeding, and may have to be considered in the future siting of hatcheries for seed production. (Little-Battelle)
W73-12118

SILICON AND THE ECOLOGY OF MARINE PLANKTON DIATOMS. I. THALASSIOSIRA PSEUDONANA (CYCLOTELLA NANA) GROWN IN A CHEMOSTAT WITH SILICATE AS LIMITING NUTRIENT,
Oslo Univ. (Norway). Dept. of Limnology.
E. Paasche.
Marine Biology, Vol 19, No 2, p 117-126, March 1973. 5 fig, 3 tab, 39 ref.

Descriptors: *Cultures, *Limiting factors, *Growth rates, *Silicates, *Cytological studies, Diatoms, Bioassay, Nutrients, Silica, Absorption, Phytoplankton, Marine algae.
Identifiers: *Chemostat, *Thalassiosira pseudonana, Culture media.

Polycarbonate Erlenmeyer flasks fitted with input and output tubes were used as chemostats for culturing Thalassiosira pseudonana. The flasks were rocked ro allow regular addition and removal of medium and diatoms. Effluent from the flasks was used as the samples for making counts and for analysis of silica content of diatoms. Silica in diatom shells was determined by a modified method of Werner (1966); cell concentrations were estimated by a combination of electronic particle counting and microscopic examination. The calculated maximum growth rates were comparable to those previously reported for this species. The silica content of the diatom shells varied with the growth rate. As the growth rate approached zero, there were still measurable quantities of residual reactive silicate in the medium. In one of the two chemostats used, silicate assimilation by the cells was inefficient due to some unknown internal or external factor. In the other chemostat, statistically calculated half-saturation constants of growth were in the range of 0.5 to 0.8 microgram-at Si/1. Half-saturation constants of steady-state mean silicate uptake per cell and hour, calculated in a similar fashion, were in the range of 1.4 to 2.6 micorgram-at Si/1. These results indicate that the silicate concentrations causing a reduced silicate uptake by this species in nature do not necessarily result in a corresponding reduced growth rate. Growth in coastal waters is likely to become seriously limited by a shortage of silicate only when most of the silicate originally present has been removed in the course of a diatom bloom. (Little-Battelle)
W73-12119

EFFECTS OF PESTICIDES ON BLUE-GREEN ALGAE,
Central Rice Research Inst., Cuttack (India). Dept. of Blue-Green Algae.
P. K. Singh.
Archiv fur Mikrobiologie, Vol 89, No 4, p 317-320, February 21, 1973. 1 tab, 7 ref.

Descriptors: *Cyanophyta, *Pesticide toxicity, *Aquatic algae, *Chlorinated hydrocarbon pesticides, *Phosphothioate pesticides, Insecticides, Water pollution effects, Plant growth, Resistance, Organophosphorus pesticides, Diazinon, Endrin, Laboratory tests.
Identifiers: Algal growth, Aulosira fertilissima, Plectonema boryanum, Cylindrospermum, Lindane, BHC, Benzene hexachloride.

A study was conducted to determine the effect of pesticides on the nitrogen-fixing blue-green algae Cylindrospermum sp., Aulosira fertilissima and the aerobic non-nitrogen-fixer, Plectonema boryanum strain 594. Commercial (Indian) pesticide preparations in granular form were used: 5 percent BHC, lindane, diazinon, and 2 percent endrin. Growth was measured in terms of percentage transmittance of suspended cultures and acetone-extracted pigment measured with a photoelectric colorimeter. Cylindrospermum sp. survived up to 10, 80, 300 and 600 micrograms/ml of BHC, lindane, diazinon and endrin, respectively, with little experimental variations. Tolerance of pesticides was almost similar in nitrogen-free and nitrate-containing medium. The number of cells decreased as the concentrations of BHC increased. A. fertilissima showed growth up to 50 micrograms/ml of BHC. Higher concentrations of this pesticide were lethal. Growth of alga was observed in 200, 400 and 500 micrograms/ml of lindane, diazinon and endrin. Its tolerance was similar in nitrogen-free and nitrate-containing medium. P. boryanum grew up to 30 microgrmas/ml of BHC. There was not much inhibition of growth in 200, 400, and 600 micrograms/ml of lindane, diazinon and endrin. There was no growth of algae in presence of any concentrations of pesticides in nitrogen-free medium. A. fertilissima and P. boryanum were comparatively more resistant than Cylindrospermum ps. (Holoman-Battelle)
W73-12128

EFFECT OF NITRATE, AMMONIA AND NITROGEN STARVATION ON THE REGULATION OF NITRATE REDUCTASE IN CYANIDIUM CALDARIUM,
Naples Univ. (Italy). Istituto di Botanica.
C. Rigano, and U. Violante.
Archiv fur Mikrobiologie, Vol 90, No 1, p 27-33, March 2, 1973. 1 fig, 2 tab, 19 ref.

Descriptors: *Deficient elements, *Nutrient requirements, *Limiting factors, Nitrates, Ammonia, Nitrogen, Cyanophyta, Enzymes, Cultures, Reduction (Chemical), Chemical reactions, Biochemistry, Assay, Nitrites.
Identifiers: *Cyanidium caldarium, *Nitrate reductase, *Biosynthesis, *Enzymatic inhibitors, Substrate utilization, Culture media, Ammonium, Ammonium ions.

Cells of Cyanidium caldarium grown with ammonia or ammonium nitrate as nitrogen source do not contain appreciable nitrate reductase activity. The alga develops the capacity to synthesize the enzyme when it is transferred from the ammonium medium to a nitrogen-free medium. Nitrate is not needed as an inducer and no enhancement in the rate of enzyme synthesis is observed when it is present. By contrast, whereas the synthesis of the enzyme in nitrogen-free medium proceeds at an increasing rate, in the nitrate medium it attains a stationary level after a short time. Nitrate grown cells possess variable amounts of inactive nitrate reductase (from 9 to 60 percent) whereas in nitrogen-free medium the enzyme occurs principally in a fully active form. Addition of ammonia inactivates reversibly the preexisting enzyme. The inactive enzyme is measurable in the crude extract after activation by heating. It is suggested that in Cyanidium the inactivating effect of ammonia, which is the end product of nitrate reduction, in association with the repression of enzyme controls the level of nitrate reductase activity. (Holoman-Battelle)
W73-12130

STUDIES ON FACTORS AFFECTING SURVIVAL OF NILE FISH IN THE SUDAN. I. THE EFFECT OF HYDROGEN ION CONCENTRATION,
Ministry of Natural Resources and Rural Development, Khartoum (Sudan). Fisheries Research Div.
M. A. Mahdi.
Marine Biology, Vol 18, No 2, p 89-92, January 1973. 1 tab, 53 ref.

Descriptors: *Hydrogen ion concentration, *Water pollution effects, *Bioassay, Cichlids, Freshwater fish, Lethal limit, Alkaline water, Acidic water, Mortality, Laboratory tests, Warm-water fish.
Identifiers: *Tilapia nilotica, *Nile fish, Median tolerance limit, Survival.

Young of Tilapia nilotica L. were subjected to acidic and alkaline media of different pH over 24-hr periods. Dilute hydrochloric acid was used to lower the hydrogen ion concentration of the test medium. A pH lower than 2.9 resulted in immediate mortality, whereas a pH of 3.5 and above produced no mortality. Alkaline media had no serious effect on survival. (See also W73-12132 and W73-12133) (Holoman-Battelle)
W73-12131

STUDIES ON FACTORS AFFECTING SURVIVAL OF NILE FISH IN THE SUDAN. II. THE EFFECT OF TEMPERATURE,
Ministry of Natural Resources and Rural Development, Khartoum (Sudan). Fisheries Research Div.
M. A. Mahdi.
Marine Biology, Vol 18, No 2, p 93-95, January 1973. 1 fig, 2 tab, 17 ref.

Descriptors: *Water temperature, *Water pollution effects, *Thermal stress, *Bioassay, Cichlids, Freshwater fish, Mortality, Lethal limit, Laboratory tests, Warm-water fish.
Identifiers: *Nile fish, *Tilapia nilotica, Survival, Median tolerance limit.

When Tilapia nilotica L. was exposed to different temperatures for 24-hr periods, scattered death points were obtaind between 36 and 40 C. Presumably other factors beside temperature affect mortality rate. The median tolerance limit (TLM) over 24 hr was 37.6 C. This temperature is higher than summer Nile water temperatures. (See also W73-12131) (Holoman-Battelle)
W73-12132

STUDIES ON FACTORS AFFECTING SURVIVAL OF NILE FISH IN THE SUDAN. III. THE EFFECT OF OXYGEN,
Ministry of Natural Resources and Rural Development, Khartoum (Sudan). Fisheries Research Div.
M. A. Mahdi.
Marine Biology, Vol 18, No 2, p 96-98, January 1973. 2 fig, 1 tab, 17 ref.

Descriptors: *Dissolved oxygen, *Bioassay, *Water pollution effects, Oxygen sag, Oxygen requirements, Cichlids, Freshwater fish, Lethal limit, Laboratory tests, Mortality, Warm-water fish.
Identifiers: *Tilapia nilotica, *Nile fish, Survival, Median tolerance limit.

Tilapia nilotica L. were exposed to different levels of ambient oxygen concentrations for 24-hr periods. Nitrogen was bubbled through the water to reduce the oxygen concentration to the respective test level. When testing concentrations of oxygen between 2.5 and 0.4 ppm over 24-hr periods of exposure, the median tolerance limits (TLM) over 24 hr were attained at 1.41 ppm of oxygen. (See also W73-12131) (Holoman-Battelle)
W73-12133

SITES OF NUTRIENT ABSORPTION IN AQUATIC MACROPHYTES,
Makerere Univ., Kampala (Uganda). Dept. of Botany.
P. Denny.
Journal of Ecology, Vol 60, No 3, p 819-829, November 1972. 3 fig, 3 tab, 29 ref.

Descriptors: *Bioassay, *Absorption, *Nutrients, *Rooted aquatic plants, *Submerged plants, Growth rates, Aquatic plants, Sediments, Mud, Sands, Pondweeds, Aquatic weeds, Grasses.
Identifiers: Potamogeton schweinfurthii, Potamogeton thunbergii, Potamogeton bunyonyiensis, Ceratophyllum demersum, Hydrilla verticillata, Vallisneria aethiopica, Hornwort, Eel grass, Coontail.

Six taxa of floating-leaved and submerged-leaved water plants (Potamogeton schweinfurthii, Potamogeton thunbergii, Potamogeton bunyonyiensis, Ceratophyllum demersum, Hydrilla verticillata, and Vallisneria aethiopica) were planted in artificial ponds in Kampala, Uganda. The substratum was divided into nutrient-rich mud and nutrient-poor sand sections, but the waters were homogeneously mesotrophic. The plants were harvested from 8 to 15 weeks after planting. Growth rates, in mg dry weight/plant/day, were calculated for roots and shoots. The growth rate of the totally submerged rootless species, C. demersum, was least affected by substratum while the floating-leaved, rooted species, P. thunbergii, showed a four-fold increase on mud. This was reflected in ratios of growth rates of root/shoot of the rooted taxa. The ratios were higher when plants were grown in washed sand, but P. Schweinfurthii, a submerged speices, showed only a small increase whereas P. thunbergii had a nine-fold greater root/shoot growth rate ratio on sand than on mud. It is concluded that nutrients may enter through roots and shoots, but in some circumstances entry may be through roots or shoots alone. (Little-Battelle)
W73-12134

THE LIFE HISTORY OF THE ALDERFLY, SIALIS AEQUALIS BANKS, IN AN ACID MINE STREAM,
Marshall Univ., Huntington, W. Va. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W73-12136

ON THE PHOTODECOMPOSITION OF CHLOROPHYLL IN VITRO,
California Univ., Berkeley. Dept. of Nutritional Sciences.
M. M. Morris, Y. Park, and G. Mackinney.
Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 277-279, March/April 1973. 6 ref.

Descriptors: *Chlorophyll, *Solar radiation, *Laboratory tests, Plant pigments, Degradation (Decomposition), Fluorescence, Irradiation, Turbidity, Niteogen, Magnesium, Solvent extractions, Distillation.
Identifiers: *Photodecomposition, *Photooxidation, Phytol, Sample preparation, Atomic absorption spectrophotometry, Saponification, Gas liquid chromatography, Organic solvents, Kjeldahl procedure.

Chlorophyll solutions can be irradiated to yield variable amounts of reddish intermediates and a virtually colorless supernatant. Precipitated after brief irradiation, the red intermediates retain a

nitrogen-phytol-magnesium ration of 4:1:1. After longer exposures, the nitrogen-magnesium ratio remains unchanged but the phytol is lost. The supernatant is evaporated to dryness and the residue is extracted successively with petroleumether, water and acetone. The petroleum ether extract is colorless with a weak blue fluorescence. It contains a phytyl ester and 10 to 15 percent of the original nitrogen. The water extract exhibits a whitish turbidity and a strong blue fluorescence. It contains a substantial fraction of the original nitrogen and magnesium. The original supernatant has negligible absorbance in the visible, but some reddish precipitate is formed on concentration. This is soluble in acetone and is devoid of phytol. (Holoman-Battelle)
W73-12146

MICROBIOLOGICAL QUALITY OF SURFACE DRAINAGE WATER FROM THREE SMALL IRRIGATED WATERSHEDS IN SOUTHERN IDAHO,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
J. H. Smith, and C. L. Douglas.
Journal of Environmental Quality, Vol 2, No 1, p 110-112, January-March 1973. 2 tab, 8 ref.

Descriptors: *Water quality, *Irrigation effects, *Coliforms, *Enteric bacteria, Water analysis, Water pollution effects, Irrigation water, Water pollution, Streptococcus, Pathogenic bacteria, Filtration, Separation techniques, Pollutant identification, Surface runoff, Idaho, Dissolved oxygen, Biochemical oxygen demand, Water temperature.
Identifiers: *Fecal streptococci, *Fecal coliforms, Most probable number test, Standard methods.

Irrigation water applied to and leaving three small watersheds in southern Idaho was analyzed to determine the influence of surface irrigation on bacteriological quality of surface runoff water. The sites were inhabited by families raising various crops and some livestock. Presumptive, confirmed, and completed coliform counts were made according to Standard Methods, MPN's were calculated, fecal coliform counts were made by MPN analyses, and fecal streptococci were determined by micropore filtrations. DO, BOD, and water temperatures were also determined. The irrigation water samples were polluted with microorganisms associated with human and animal wastes, as indicated by numbers of coliforms and by fecal coliform/fecal streptococci ratios. There was a trend toward increasing numbers of coliforms and fecal coliforms in the drainage water compared to the irrigation water, but the differences were generally within the confidence limits for MPN analyses. On two of the three watersheds, microorganisms incubated on plating agar at 20C had higher counts in the drainage than in the irrigation water. Fecal streptococci numbers were significantly higher in the drainage than in the irrigation water on two of the three small watersheds. Even though microorganisms counts tend to be higher in drainage than in the irrigation water on these three small watersheds, irrigation use has a minimal deleterious effect on the microbiology of these waters. (Little-Battelle)
W73-12151

COOLING TOWERS AND WATER QUALITY,
Central Electricity Generating Board, London (England). Research Dept.
F. F. Ross, and J. W. Whitehouse.
Water Research, Vol 7, No 4, p 623-631, April 1973. 2 tab, 8 ref.

Descriptors: *Cooling towers, *Water quality, *Thermal powerplants, Oxygenation, Water purification, Dissolved oxygen, Saturation, Cooling water, Slime, Water quality control, Benthic fauna, Biochemical oxygen demand, Oligochaetes, Crustaceans, Isopods, Amphipoda, Waterfleas, Copepods, Insects, Diptera, Dragonflies, Mollusks, Gastropods, Fish, Snails, Tubificids, Midges, Perches, Sticklebacks, Hydroelectric plants.
Identifiers: Limnodrilus hoffmeisteri, Tubifex tubifex, Asellus aquaticus, Gammarus spp, Simocephalus, Bosmina coregoni var. lilljeborgi, Ilyocryptus, Alona rectangula, Rhynochotalona rostrata, Pleuroxus spp, Chydorus sphaericus, Heterocypris incongruens, Cypridopis vidua, Limnocythere, Cyclops bicuspidatus, Eucyclops agilis, Ischnura elegans, Physa acuta, Lymnaea pereger, Hydrobia jenkinsi, Gasterosterus aculeatus, Perca fluviatilis, Pleuronectes flexus, Ostracods, Pouch snails, Pond snails, Three spined stickleback.

Where direct use of water for thermal power plant cooling is possible without harm to benthic organisms, cooling towers are contra-indicated. Where stream flow is inadequate for direct cooling and cooling towers are necessary, they can effect a significant quality improvement in polluted water. Organisms which gain access to and colonize the tower ponds appear to be instrumental in reducing the rate of accumulation of humus sludge. (Holoman-Battelle)
W73-12155

ASPECTS OF THE BIOLOGY OF THE LUMBRICIDS EISENIELLA TETRAEDRA (SAVIGNY) AND DENDROBAENA RUBIDA (SAVIGNY) F. SUBRUBICUNDA (EISEN) IN A PERCOLATING FILTER,
Water Pollution Research Lab., Stevenage (England).
J. F. D. G. Solbe.
J Appl Ecol. Vol 8, No 3, p 845-867. 1971. Illus.
Identifiers: Biology, Dendrobaena-Rubida-Subrubicunda, Eiseniella-Tetraedra, *Filters (Percolating), *Lumbricids, *Sewage purification, Invertebrates.

The development of populations of these lumbricids is described and compared. Oxygen consumption, ammonia excretion, the average feeding rate and assimilative efficiency are calculated. The contributions of macro-invertebrate respiration in sewage purification and other benefits are discussed.–Copyright 1972, Biological Abstracts, Inc.
W73-12175

MERCURY LEVELS IN MARINE BIOTA,
Hawaii Univ., Honolulu.
H. Klemmer, and S. N. Luoma.
Quality of Coastal Waters, Project Bulletin No 6, January 1973. 2 p, 1 fig, 1 tab.

Descriptors: *Mercury, *Water pollution sources, *Fish toxins, *Marine biology, *Path of pollutants, Hawaii, Public health, Water pollution, Fish, Fish diets, Posions, Fish management, Marine animals, Pollutant identification, Food chains.

As part of the quality of coastal water project, recent studies of mercury levels in a wide range of biota collected from a nearshore area on Kauai, Hawaii, indicate that benthic feeders show a greater ability to accumulate mercury than animals feeding above the sediment-water interface. Moreover, the study suggests that, contrary to traditional assumptions, the most effective pathway of mercury transport may not be through a linear food-chain from plankton to herbivore to carnivore, but that greater concentrations of mercury may be found in organisms associated with short food chains linked directly to the benthos. In deeper Hawaiian waters, the pelagic carnivores, marlin, tuna, and mahimahi, appears to contain appreciably higher levels of total mercury than five nearshore species of fish, as indicated by measurements made recently and summarized in a table which accompanies the report. (Mockler-Florida)
W73-12195

ENVIRONMENTAL STATEMENT, RIO BLANCO GAS STIMULATION PROJECT, RIO BLANCO COUNTY, COLORADO.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-12258

UPTAKE OF MERCURY BY PLANTS AND ITS DISTRIBUTION IN LIVING ORGANISMS IN AN ENVIRONMENT WITH INCREASED CONCENTRATION OF THIS ELEMENT,
Ljubljana Univ. (Yugoslavia).
L. Kosta, A. R. Byrne, P. Stegnar, and V. Zelenko.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016; $6.00 for proceedings. In: Radiotracer Studies of Chemical Residues in Food and Agriculture, International Atomic Energy Agency, Vienna, p 47-59, 1972, 2 fig, 6 tab, 3 ref.

Descriptors: *Mercury, *Vegetation, *Absorption, *Public health, Industrial wastes, Organic compounds, Analytical techniques, Gas chromatography, Food chains, Animal metabolism, Freshwater fish, Path of pollutants, Environmental effects, Fish diets, Water pollution effects, Toxicity.

Study of the area around the Mercury mine at Idrija was extended to include analysis for methyl Hg. The ratio of methyl Hg/total Hg in fish increased distance downstream from the mine, approaching 1 at a distance of 35 km. Hg and other elements were measured in vegetation, and Hg uptake by rabbits from vegetation. In rabbits, Hg was checked regularly in blood, urine, and feces. The analytical technique was based on reaction of methyl Hg cyanide vapor with either cysteine or glutathione, extraction into benzene, and gas chromatography. The sensitivity was 1 ppb using 0.1-1 g samples. (Bopp-ORNL)
W73-12262

SOME REMARKS ON MERCURY AS AN AQUATIC POLLUTANT AND ITS IMPLICATIONS,
Helsinki Univ. (Finland). Dept. of Radiochemistry
J. K. Miettinen.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016; $6.00 for proceedings. In: Radiotracer Studies of Chemical Residues in Food and Agriculture, International Atomic Energy Agency, Vienna, p 61-68, 1972, 1 fig, 32 ref.

Descriptors: *Mercury, *Public health, *Fish diets, *Water pollution effects, Reviews, Sediments, Organic compounds, Metabolism, Bacteria, Freshwater fish, Toxicity, Commercial fish, Marine fish, Reviews.

This review of 1970-71 literature includes occurrence of mercury in water, sediments, and marine fish; safe levels for fish in the diet; metabolism of methyl Hg; microbial methylation of Hg in sediments; and evalaution of the risk to populations. Dimethyl Hg (14% of the total Hg) volatilized when dredged sediment was exposed to air. Microbial methylation of Hg in sediments is possibly a detoxification mechanism of the organism, is slow, and requires oxygen. Freshwater fish contain 5-10 ppm in several areas of the USA, 1-5 ppm in 50 other areas. Swordfish exceed the 0.5-ppm limit. (Bopp-ORNL)
W73-12263

SIGNIFICANCE OF MERCURY IN THE ENVIRONMENT: SUGGESTIONS FOR FURTHER RESEARCH,
Department of Agriculture, Saskatoon (Saskatchewan).
J. G. Saha.
Available from UNIPUB, Inc., P.O. Box 433, New York, N.Y. 10016; $6.00 for proceedings. In: Radiotracer Studies of Chemical Residues in Food and Agriculture, International Atomic Energy Agency, Vienna, p 81-86. 1972.

Descriptors: *Mercury, *Environmental effects, *Public health, *Water pollution effects, Toxicity, Water pollution sources, Absorption, Fish, Path of pollutants, Sediments, Fossil fuels, Air pollution, Precipitation (Atmospheric), Metabolism, Biochemistry, Organic compounds, Analytical techniques, Radioactivity techniques, Food chains, Fish diets.

Problems include: (1) More-extensive measurements and more reliable analytical techniques; (2) extent of the contribution of burning of fossil fuels to the Hg received by the earth's surface in rainfall; (3) environmental factors affecting the formation of highly toxic methyl Hg from other forms; (4) sources of Hg pollution of water and their relative importance; and (5) the biochemistry of methyl Hg poisoning and its treatment. The dangerous Hg level in blood is about 2000 ng/g; the level in about 80% of people without occupational exposure, less than 5 ng/g. Instances of local environmental poisoning include consumption of fish (which may show 3000 times the concentration of the surrounding water), and of seed grain treated with mercurials. (Bopp-ORNL)
W73-12265

SOME CONSERVATIONAL PROBLEMS POSED BY HYDROELECTRIC POWER INSTALLATIONS IN ALBERTA,
Department of Lands and Forests, Lethbridge (Alberta).
D. S. Radford, and R. Hartland-Rowe.
Biol Conserv. Vol 4, No 3, p 166-168. 1972. Illus.
Identifiers: *Benthic invertebrates, *Canada (Alberta), Conservation, *Hydro-electric powerplants, Installations, Invertebrates, Power, Recreation, *Kananaskis River (Alberta).

The regulation of flow of the Kananaskis River, Alberta, for hydroelectric purposes, results in unusually low standing crops of benthic invertebrates and in usually high rates of drift of such organisms. Although the regulation of flow offers various benefits, including protection from spring floods, dilution of pollutants, and the provision of electric power for peak demand periods, the recreational and ecological impairment of the environment is considerable and should be taken into account in planning future hydroelectric developments.--Copyright 1972, Biological Abstracts, Inc.
W73-12268

STATE UNIVERSITY OF NEW YORK, COLLEGE AT PLATTSBURGH, LAKES AND RIVERS RESEARCH LABORATORY 1972 TECHNICAL REPORT.
For primary bibliographic entry see Field 05B.
W73-12321

TOXICITY OF LEAD NITRATE TO FIVE SPECIES OF FRESHWATER ALGAE,
State Univ. Coll., Plattsburgh, N.Y. Miner Inst. of Man and His Environment.
J. L. Malanchuk, and G. K. Greundling.
In: State University of New York Lakes and Rivers Research Laboratory 1972, Technical Report, p 1-24, February 1973. 6 fig, 2 tab, 20 ref.

Descriptors: *Algae, *Lakes, *Lead, Poisons, Water pollution effects, *Toxicity, Nutrients, Carbon radioisotopes, Carbon dioxide, Primary productivity.
Identifiers: Carbon fixation.

Toxicity of Pb (NO3)2 to five species of algae was measured. Portions of unialgal cultures were inoculated into low salt medium and were used to test all species at 10, 20, and 30 ppm Pb. This medium approximated the salt concentrations of natural aquatic environments. Three different cell weights were used for each concentration of lead and for the control to determine a relationship between cell weight and toxicity. The concentration of lead causing a 50% reduction of C-14 fixation as compared to the control was called the ED-50. The ED-50 for three of the species tested (Anabaena, Chlamydomonas, and Navicula) was between 15 and 18 ppm Pb. A desmid, Cosmarium, had an ED-50 of 5 ppm. This species has a higher surface:volume ratio than the other species tested which accounts for its increased sensitivity. Throughout the experiments the fixation of C-14 increased with increasing Pb concentrations. (See also W73-12321) (Knapp-USGS)
W73-12322

ON THE WATER QUALITY OF LAKE BIWA--KO AND THE INHABITABILITY OF THE BIVALVE, CORBICULA SANDAI, IN THE SETA RIVER, (IN JAPANESE),
Shiga Univ., Otsu (Japan). Faculty of Education.
O. Itasaka, M. Sugita, Y. Okumura, and T. Hori.
Mem Fac Educ Shiga Univ Nat Sci. 20, p 18-34. 1970. Illus. English summary.
Identifiers: *Bivalves, *Corbicula-Sandai, Inhabitability, *Japan (Lake Biwa-Ko), Lakes, Minerals, Rivers, Water quality, Seta River (Japan).

The water quality of both Lake Biwa-ko and the Seta River was investigated 3 times during July to Sept. of 1970. Items for the observation were water temperature, pH, dissolved O2, KMnO4 consumption, total-N, NH3-N, NO2-N, NO3-N, SiO2, total-P, PO4-P and transparency. The present investigation showed that the southern part of the lake was transformed into a eutrophic state in a few years. The survey of bivalve distribution in the Seta River has been continued since 1960. The population density during the decade has decreased to about 0.1.--Copyright 1972, Biological Abstract, Inc.
W73-12344

5D. Waste Treatment Processes

WATER REUSE, A BIBLIOGRAPHY, VOLUME 1.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 998, $6.00 paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-215. June 1973, 394 p.

Descriptors: *Artificial recharge, *Desalination, Filtration, Groundwater, Industrial wastes, Ion exchange, *Irrigation water, Municipal wastes, Pollution abatement, Potable water, Recirculated water, *Reclaimed water, Return flow, *Reverse osmosis, *Sewage treatment, *Tertiary treatment, Waste disposal, *Waste water treatment, Water conservation, Water purification, Water quality, *Water treatment.

This report, containing 263 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published through 1969. Author and subject indexes are included. (See also W73-11702).
W73-11701

WATER REUSE, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 999, $6.00 paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-215. June 1973. 508 p.

Descriptors: *Artificial recharge, Cooling towers, *Desalination, Heated water, *Industrial wastes, Irrigation, Municipal wastes, Pulp wastes, *Reclaimed water, *Sewage treatment, *Tertiary treatment, *Waste water treatment, Water quality, *Water treatment, Water conservation.

This report, containing 342 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published in 1970-1972. Author and subject indexes are included. (See also W73-11701).
W73-11702

KINETICS OF MICROBIALLY MEDIATED METHYLATION OF MERCURY IN AEROBIC AND ANAEROBIC AQUATIC ENVIRONMENTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05B.
W73-11711

HYDROGYNAMIC FLUX CONTROL FOR WASTE WATER APPLICATION OF HYPERFILTRATION SYSTEMS,
Oak Ridge National Lab., Tenn.
D. G. Thomas, and R. B. Gallaher.
Copy available from GPO Sup Doc as EP1.23/2: 73-228, $1.25; microfiche from NTIS as PB-222 005, $1.45. Environmental Protection Technology Series Report No EPA-R2-73-228, May 1973. 80 p, 28 fig, 10 tab, 22 ref. EPA Project 17020-FEV. 14-12-896.

Descriptors: Fouling, *Hydrodynamics, Control, Velocity, Filtration, Reverse osmosis, Waste water treatment.
Identifiers: Particulates, Flux control, Flux decline, Hyperfiltration.

The effect of hydrogynamics on flux decline of cellulose acetate hyperfiltration membranes was studied using primary effluent from the Oak Ridge East Sewage Plant as feed. The system contained multiple, annular-geometry housings which could be operated simultaneously at different velocities with the same feed. The range of fluxes studied was from 2 to 150 gal./ft2 day and axial velocities ranged from 3 to 30 ft/sec. System pressure was 600 psig. The results demonatrate that there is a threshold velocity above which flux decline is markedly smaller than at lower velocities. Visual inspection of the membranes after a test indicates that operation above the threshold velocity markedly reduces accumulation of solids during the first 200-300 hours of a test. In scouting studies addition of a flocculant appeared to markedly reduce the threshold velocity. During the initial 200-300 hours of those tests with primary sewage effluent as feed and in which the axial velocity was above the threshold velocity, the flux decline parameter, b, (b ± - (delta log flux)/ (delta log time)) was directly proportional to the six-tenths power of the flux and inversely proportional to the square root of the velocity. (EPA)
W73-11713

ANAEROBIC-AEROBIC TREATMENT OF TEXTILE WASTES WITH ACTIVATED CARBON,
Palisades Industries, Inc., Peace Dale, R.I.
C. P. C. Poon, and P. P. Virgadamo.
Copy available from GPO Sup Doc as EP1.23/2: 73-248, $2.85, microfiche from NTIS as PB-221

985, $1.45. Environmental Protection Technology Series Report No EPA-R2-73-248, May 1973. EPA Project 12090 EQO.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Activated carbon, Adsorption, *Biochemical oxygen demand, *Chemical oxygen demand, Pilot plants, Industrial wastes.
Identifiers: *Total organic carbon.

The operation of an anaerobic-aerobic bio-oxidation treatment system utilizing activated carbon was studied for 24 months at Palisades Industries, Peace Dale, Rhode Island. Biological oxidation and conversion of soluble organic waste constituents took place in the aerated basin operated as a mixed dispersed growth reactor without return sludge. Washed out solids from the aeration basin were filtered by a parallel set of activated carbon columns. The entrapped solids were then hydrolized when these columns were regenerated in place anaerobically. A second parallel set of carbon columns provided for additional removal of solids and soluble organics. However, the biological regeneration in these columns was carried out aerobically. Both the laboratory and the large scale piolot plant experiments revealed (1) good color removal; (2) oxidation of organic chemicals fed to the system; (3) major reduction in BOD and COD in the waste effluent stream; and (4) continued biological regeneration of the activated carbon; and (5) high degree of removal of suspended solids without conventional equipment. This study has demonstrated that waste streams from a typical cloth dyeing and finishing operation can be effectively treated using activated carbon coupled with biological regeneration. The advantages to this system are a result of the catalytic effect rendered by the activated carbon on difficult to degrade organic molecules and the small space requirements in respect to conventional treatment systems for an equivalent degree of treatment. (EPA)
W73-11715

ORANGE COUNTY WATER DISTRICT'S WATER FACTORY 21,
Orange County Water District, Santa Ana, Calif.
J. R. Cofer.
J Irrig Drain Div, Am Soc Civ Eng, Vol 98, No IR4, p 553-567, Dec 1972. 7 fig, 3 tab.

Descriptors: *Water reuse, *Desalination, *Groundwater recharge, Waste water treatment, Water treatment, Sanitary engineering, Water management (Applied), Desalination plants, Desalination processes, Environmental effects, Injection wells, Groundwater, Costs, *California.
Identifiers: Orange County (Calif), Vertical tube unit, Waste water use, Multistage flash distillation, Salt water barriers.

An advanced design fresh water factory is being constructed in Orange County, California. The factory consists of waste water reclamation plant and sea water desalting module to supply fresh water to a 30 mgd sea water barrier ground water basin replenishment system. The paper describes the advanced waste water reclamation plant and sea water desalting plant being implemented by the Orange County Water District, and the utilization of the product water from the 2 plants in the ground water injection program. The waste water reclamation process includes: lime coagulation, ammonia stripping, recarbonation, mixed media filtration, activated carbon adsorption, chlorination, and blending. The sea water desalting plant will use the vertical tube evaporation multistage flash process. Use of waste heat from the desalting plant in the reclamation process, and the resolution of adverse environmental impacts are analyzed; long-range implications of the fresh water factory in the management of the ground water basin are postulated. (USBR)
W73-11719

THE ALUMINA-LIME SODA WATER TREATMENT PROCESS,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 03A.
W73-11748

SOLID WASTE MANAGEMENT FOR CATTLE FEEDLOTS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
J. M. Sweeten, W. S. Allen, and D. L. Reddell.
Cattle Feeders' Information, Publication No L-1094, (1973), 4 p.

Descriptors: *Solid wastes, *Storage, *Ultimate disposal, Groundwater, Pollutants, Aquifers, *Waste water treatment, Fertilizers, *Feed lots, Cattle, Farm wastes.

Information is presented for commercial cattle feedlots on methods and costs of solid feedlot waste management; equipment selection guidelines; and agronomic effects of applying feedlot manure to cropland. (Lee-East Central)
W73-11766

MANURE SLURRY IRRIGATION SYSTEM RECEIVING LOT RUNOFF,
Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
J. I. Sewell.
Paper presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper no. 72-443, 13 p, 7 fig, 5 ref.

Descriptors: *Pollution abatement, Runoff, Groundwater, *Slurries, Irrigation systems, *Cattle, Farm wastes, Waste disposal, Management, Feed lots.

Plans for facilities and system design for a manure slurry irrigation system are presented. This system consisting of a storage tank, chopper-agitator-pump unit, flush pits, irrigation pipe and a large sprinkle performed durably in testing and offered possibilities for improved efficiency in manure management. It created a minimum of pollution problems. The operational plans and system costs are outlined. (Fomby-East Central)
W73-11767

USE OF DUCKWEED FOR WATER TREATMENT AND ANIMAL FEED,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
D. D. Culley, Jr., and E. A. Epps.
Journal Water Pollution Control Federation, Vol 45, No 2, p 337-347, February, 1973. 1 fig, 5 tab, 28 ref.

Descriptors: *Farm wastes, Waste water treatment, Farm lagoons, Nutrient removal, Feeds, Livestock.
Identifiers: *Duckweed, Lemnaceae.

This scientific study was established to search for aquatic plants suitable for nutrient reduction in animal waste lagoons and for utilization in animal feeds. Criteria for evaluating the aquatic plants are given. Chemical composition of plants from the family lemnaceae are shown in tables based on eight test sites. Duckweed shows great potential, but minor problems include toxic buildup and excess water content. (Marquard-East Central)
W73-11769

HOUSED CONFINEMENT - AN ANSWER FOR FEEDING IN NORTHERN CALIFORNIA,
E. W. Manthey.
Feedlot Management, Vol 14, No 2, p 10-16, February, 1972. 6 photos, 1 fig.

Descriptors: *Feed lots, *Waste disposal, *Farm wastes, California, Confinement pens, Cattle.
Identifiers: Cow toilet.

Physical facilities are described and pictured for a housed feedlot that takes advantage of northern California's market and feed supply and overcomes the problem of the wet season. Construction time/cost are cut by new methods of casting concrete slotted floors in place. The pit beneath the lot is scraped continuously by a cable driven blade and disposed of on 160 acre fields by sprinkle irrigation. Rain runoff and overflow of troughs are piped to a pond. (Marquard-East Central)
W73-11770

THE OPCCO DRYER.

Agricultural Engineering, Vol 53, No 6, p 16-17, June, 1972. 2 fig.

Descriptors: *Recycling, Drying, Fertilizers, *Farm wastes, *Waste treatment, Poultry, Feeds.

A solid waste management system, developed and patented by Harvey Wenger and manufactured by Organic Pollution Control Corp., has been placed on several large poultry farms to turn poultry litter into fertilizer or into a feed additive for livestock. Michigan State University's Dr. Howard Zindel and other experts feel that the dryer, used so far primarily with poultry manure, can successfully handle all forms of animal wastes plus packing house offal, vegetable and fruit peel and pulp, and municipal sewage. Requiring an area of about 20-40 feet, the 40 ton per day unit operates on either natural or LP gas. Plans for developing other power supplies are being studied. The drying process is described and a schematic of the flow path is shown. The process is not inexpensive, but it does supply a solution to the waste problem. (Wetherill-East Central)
W73-11771

THE GREAT MANURE DILEMMA,
For primary bibliographic entry see Field 05E.
W73-11773

BEEF CATTLE FEEDLOT RUNOFF, SOLIDS TRANSPORT AND SETTLING CHARACTERISTICS,
Nebraska Univ., Lincoln.
C. B. Gilbertson, J. A. Nienaber, T. M. McCalla, J. R. Ellis, and W. R. Woods.
Transactions of the ASAF (American Society of Agriculture Engineers), Vol 15, No 6, p 1132-1134, 1972, 6 fig, 8 ref. Support in part by EPA.

Descriptors: *Feed lots, Runoff, Continuous flow, *Farm wastes, Cattle, *Waste water treatment.
Identifiers: *Solids removal systems, Batch system.

Removing settleable solids from beef cattle feedlot runoff requires a working knowledge of the relationships between precipitation, runoff, solids, transport, and settling of the transported solids. The authors give physical descriptions of the working area and develop estimating equations which can be used to assist in design of solids removal systems in geographic areas with similar climatic and feedlot conditions. Two systems, a 'batch system', and a 'continuous flow' system, were constructed. In laboratory tests (Imhoff cone tests), about 40% of the total solids transported (by weight) settled in 16 to 18 minutes at zero velocity of flow. Calculated bulk density of settleable solids was 6.71 lb. per cu. ft. with a standard deviation of 3.69 lb. per cu. ft. It was recommended that an open channel should be equipped with barriers to restrict runoff flow to near zero velocity to remove sufficient solids to maintain a satisfactory condition within the holding pond. (Wetherill-East Central)
W73-11774

PERFORMANCE OF BEEF ANIMALS AS AFFECTED BY CROWDING AND THERMAL ENVIRONMENT DURING A FALL-WINTER PERIOD,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
G. W. A. Mahoney, A. F. Butchbaker, and J. I. Fryrear.
Paper presented at 65th Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper No, 72-426, 18 p, 5 fig, 1 tab, 6 ref.

Descriptors: Production, Cattle, Windbreaks, *Oxidation lagoons, *Waste water treatment, *Farm wastes, Productivity, Feeds.
Identifiers: Crowding, Slotted floors, Weight gain.

Results of feed trials made in fall-winter periods of 1969-1972 are reported. The objectives of these trials were: (1) Compare production and feed consumption for 3 levels of crowding, (2) Compare production and feed consumption rates for cattle on slotted floors with wind breaks and shades with cattle in open cattle pens, (3) Determine performance of a cattle waste oxidation ditch for fall-winter operation in the Southwest. Corresponding results were: (1) Maximum gains and feed efficiency were obtained at approximately 20-22 square feet per animal. (2) Weight gain of cattle on slotted floors was not significantly greater than those in open pens, (3) Cold weather freezing indicated that enclosure of oxidation ditches might be necessary for their effective use in the Southwest. (Marquard-East Central)
W73-11776

OBSERVATIONS OF DAIRY MANURE HANDLING SYSTEMS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
D. W. Bates.
Paper presented at 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 27-30, 1972, Paper No 72-413, 3 p.

Descriptors: *Waste disposal, *Waste storage, *Farm wastes, Waste treatment, Cattle, Dairy industry.
Identifiers: Stall barn, Stacking system, Bedding, Solid alleys, Slatted alleys, Liquid manure systems.

Because of the need to reduce labor in handling manure, the cost of bedding, and regulations dealing with the handling and disposition of animal manure, old manure disposal methods are being replaced by new. Various systems for the daily hauling will depend somewhat on whether the farmer has a stall barn or free-stall barn. Slatted or solid alleys, automatic scrapers, and a new manure pump which forces manure from a collection point in the barn through a pipe to an external manure pit for storage and later removal are discussed. Storage capacity is an important facet for dairymen, particularly in the colder regions of the country. Advantages of figuring construction costs prior to building, and disadvantages of 'adding on' are discussed. (Dudley-East Central)
W73-11777

ANOTHER POSSIBLE PROCESS FOR MANURE.

Calf News, Vol 11, No 1, p 38, January, 1973.

Descriptors: Feedlots, Farm wastes, *Waste treatment, Fertilizers, Ammonia.

A theory has been developed for the processing of manure which could produce 1,000 tons of ammonia per day from the manure deposits of around 600,000 cattle. This theory proposes that the manure be partially oxidized in the presence of the correct amount of air so that a synthetic gas is produced in the correct ratios to be used for ammonia production. By this process, the manure would be converted into an easily transported fertilizer which then would go back to the land to insure high crop yields. This process may also prove an answer to the problem of cattle feedlot pollution. (Anderson-East Central)
W73-11780

A LOVELY NEW SCENT FOR MANURE.
Calf News, Vol 9, No 10, p 4. October, 1971.

Descriptors: *Air pollution, *Sagebrush, *Farm wastes, Odor, Water pollution control.

A method of reducing manure odor with a sage brush feed additive has been discovered. This additive, which causes continuous production of volatile oils in manure and urine, seems to improve the health of the cattle with no detectable change in the taste of the beef. Plans for future research include spraying of feedlots with sage oils. The oils can be synthetically produced, but there is an abundance of natural sage. The product is not yet commercially available. (Fomby-East Central)
W73-11783

FIVE FEEDING SYSTEMS COMPARED.
Feedlot Management. p 34-37, January, 1971. 8 fig.

Descriptors: *Feed lots, Performance, Runoff, *Farm wastes, Cattle, Confinement pens.
Identifiers: Animal density, Open lot, Open shed, Cold barn, Warm barn.

Preliminary results are given on the influence of various housing systems on beef cattle and the effect of animal density on feedlot performance. It is indicated that housed confinement should be used to capacity and maintained year round for maximum benefits. Housed confinement tends to control illness and high density does not seem to jeopardize health or feed efficiency. Advantages and disadvantages are given for each type of housing studied. The five types of housing are open lot, open shed, manure pack shed, cold barn and warm barn. All five systems are designed to contain all animal wastes. (East Central)
W73-11784

FEEDERS HEAR WOES OF CONFINEMENT START.

Beef, p 16-17. July, 1971.

Descriptors: Ammonia, Feed lots, Waste storage, *Farm wastes, Oxidation, Proteins, Iowa, *Oxidation lagoons, Waste water treatment, Livestock.

Problems of an oxidation ditch at Iowa State University are described. Because the start-up period was during the winter, ammonia foam resulted. Later, equipment malfunctions, protein foam, and freezing of sewage created problems. How each problem was met, is described. (Marquard-East Central)
W73-11787

FEED 'EM TRASH, CUT POLLUTION.
Beef, p 12. July, 1971.

Descriptors: Cellulose, Brush control, *Farm wastes, *Recycling, Proteins, *Feed lots, Texas, Feeds.

Texas Tech researchers have devised a process that takes paper, manure, brush, or any substance with cellulose and converts it to protein and sugar. The product can be used for animal feed and possibly in the future for human consumption. (Marquard-East Central)
W73-11789

DIRECT OBSERVATION OF REVERSIBLE FORMATION OF ANIONIC SIGMA COMPLEXES RELATED TO TRANSITION STATE ANALOGS FOR ADENOSINE DEAMINASE,
Georgia Inst. of Tech., Atlanta. School of Chemistry.
For primary bibliographic entry see Field 01B.
W73-11852

SEWAGE TREATMENT SYSTEM,
Missouri Engineering Corp., Rolla. (assignee)
R. A. Lemberger, and J. L. Gilmore.
U.S. Patent No 3,724,664, 6 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 178, April 3, 1973.

Descriptors: *Patents, Equipment, *Sewage treatment, *Aeration, *Waste water treatment, *Water quality control, *Water pollution control, *Pollution abatement.
Identifiers: Settlement, Water pollution prevention.

This system consists of the following items: a below-ground tank for receiving sewage; an effluent sprinkler above ground; a pump with a discharge end; a connection between the pump and sprinkler; and a connection between the tank end and the discharge end of the pump. The tank is divided into a settlement chamber and an aeration chamber. The pump is situated within the aeration chamber. Safety float switches are advantageously placed. A control valve is of a two position character; in one position, effluent is recirculated within the aeration chamber, and in the other position, effluent is discharged through the sprinkler for dispersion. The operation of the control valve and pump is governed by a timer. (Sinha-OEIS)
W73-11872

APPARATUS AND SYSTEM FOR REMOVAL OF LATEX FROM WASTE WATER,
Clarkson Industries, Inc., New York. (assignee)
W. H. Scott, Jr.
U. S. Patent No 3,726,794, 4 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 909, No 2, p 683, April 10, 1973.

Descriptors: *Patents, Equipment, *Waste water treatment, *Chemical reactions, Sludges, *Pollution abatement, *Industrial wastes, *Water quality control, *Water pollution control.
Identifiers: *Chemical treatment, Latex.

Waste water containing latex is led into a mixing compartment where treating chemicals are also deposited. The mixture is moved to a settling tank and then disposed in a polishing tank where other chemicals are added to the mixture. The settled sludge is removed by an endless conveyor. The chemicals to be used are not identified. Details are given on the control and pumping systems. (Sinha-OEIS)
W73-11874

WASTE WATER TREATMENT SYSTEM,
E. T. Armstrong.
U.S. Patent No 3,730,881, 12 p, 12 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, P 289, May 1, 1973.

Descriptors: *Patents, *Waste water treatment, *Sedimentation, Trickling filters, *Activated sludge, *Disinfection, Aerobic conditions, *Biological treatment, *Pollution abatement, *Water quality control, *Water pollution control, Ozone.
Identifiers: Flotation separation, *Water pollution prevention.

This system includes a primary sedimentation tank, a primary bioprocessing tank, and a primary disinfection tank, all of which operate with the influent under aerobic conditions. Means are provided to receive raw waste at the input to the pri-

mary sedimentation tank and pass it throughout the system to the output of the disinfection tank. Explanations are given on the use of microorganisms in waste treatment, the settling or sedimentation process, flotation separation. roughing (trickling filter), bioprocessing second stage activated sludge, system optimization and the characteristic load, the disinfection system, force main injection and on system integration. Structural improvements in settling reduce velocity, inhibit boundary layer separation and act to suppress mixing of the sewage. In the bioprocessing operations, the key is to improve efficiency of the liquid-gas exchange to achieve better oxygen contact. The liquid-gas exchange feature utilizes a high momentum exchange under turbulent flow conditions in a hydraulic pressure gradient. (Sinha-OEIS)
W73-11878

INTERNAL PRECIPITATION OF PHOSPHATE IN SETTLING ZONE,
Biospherics, Inc., Rockville, Md. (assignee)
G. V. Levin, and G. J. Topol.
U.S. Patent No 3,730,882, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, p 289, May 1, 1973.

Descriptors: *Patents, *Sewage treatment, *Biochemical oxygen demand, *Phosphate, Nutrient removal, Microorganisms, *Aeration, *Biological treatment, *Pollution abatement, Activated sludge, *Water pollution control, *Water quality control, *Water resources.
Identifiers: *Water pollution prevention.

A process is described for treating raw or treated sewage to obtain a substantial phosphate-free effluent which is to be disposed in natural water resources. Influent sewage is mixed with activated sludge to provide a mixed liquor. The mixed liquor is passed to an aeration zone to reduce its BOD content. The microorganisms present in that zone take up the phosphate. In the settling zone, phosphate-enriched sludge settles into the anaerobic layer and the phosphate-free effluent is removed from above the layer of sludge. A phosphate precipitant is added to the sludge holding soluble phosphate in the liquid phase thereof to precipitate the water soluble phosphate. There results a mixture of precipitated phosphate particles, sludge organisms that have given up intracellular phosphate and a phosphate-depleted aqueous phase. This mixture is recycled for mixing with influent sewage. One example is cited. (Sinha-OEIS)
W73-11879

SEWAGE DISPOSAL METHOD,
L.A.A. Lefrancois.
U.S. Patent No 3,730,883, 3 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, p 289, May 1, 1973.

Descriptors: *Patents, *Waste water treatment, *Agriculture, *Food processing industry, *Fermentation, *Microorganisms, *Aeration, *Pollution abatement, *Water quality control, *Water pollution control.
Identifiers: *Water pollution prevention.

Waste liquid is introduced continuously into a fermentation apparatus in order to preserve throughout the liquid mass a homogeneity of the solid, liquid, and gaseous fractions, and to ensure a maximum dispersion of the microorganisms. Air is blown continuously into the apparatus in order to further ensure the dispersion of the microorganisms. The liquid more or less loaded with organic substances, such as activated sludge, is drawn off continuously from the fermentation apparatus to maintain a constant mass of treated liquid in the apparatus. (Sinha-OEIS)
W73-11880

METHOD OF PURIFYING WATER,
Aktiebolaget Atomenergi, Stockholm (Sweden). (assignee)
For primary bibliographic entry see Field 05F.
W73-11881

METHOD AND APPARATUS FOR DETERMINING OXYGEN CONSUMPTION RATE IN SEWAGE,
Robertshaw Controls Co., Richmond, Va. (assignee)
R. D. Mikesell.
U.S. Patent No 3,731,522, 4 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 463, May 8, 1973.

Descriptors: *Patents, *Sewage treatment, *Dissolved oxygen, Bacteria, *Waste water treatment, *Oxygenation, Equipment, *Pollution abatement, *Water quality control, *Water pollution control.
Identifiers: *Water pollution prevention.

The continuous respirometer provides an indication of the rate at which oxygen is being consumed by the bacterial population in the sewage. A means for sensing the amount of oxygen in the fluid entering the container is provided as well as a means for sensing the amount of oxygen exhausted at the outlet. A pump is provided for circulating the sewage through the closed container at a constant flow rate so that the amount of dissolved oxygen in the sewage may be determined. The respirometer may be adapted for use in natural water bodies. (Sinha-OEIS)
W73-11883

LIQUID FILTER,
T. M. Walters.
U.S. Patent No 3,731,814, 7 p, 15 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 538, May 8, 1973.

Descriptors: *Patents, Filters, *Filtration, Equipment, *Water treatment, *Pollution abatement, *Water pollution control, *Water quality control.
Identifiers: *Water pollution prevention.

The filter uses one or more drum-like inner chambers in which both the cylindrical surface and the flat circular surfaces of an inner chamber are provided with filter screens. The interior of the drum-like inner chamber is provided with washer arms adjacent to all filtration screens in such manner that relative motion of the arms to the drum causes the washer arms to squeeze out or scoop up the liquid within the drum and push this liquid outward through the screens. Trial and error experiments determine the proper rotational speed for the chosen surface area of the screen and the size of the screen mesh. (Sinha-OEIS)
W73-11884

SUBMERGED FILTER-HORIZONTAL FLOW MODE,
Research Corp., New York. (assignee)
J. W. Klock.
U.S. Patent No 3,732,160, 5 p, 3 fig, 5 ref; Official Gazette of the United State Patent Office, Vol 910, No 2, p 621, May 8, 1973.

Descriptors: *Patents, *Waste water treatment, *Filtration, Oxygen, *Aerobic conditions, Equipment, *Pollution abatement, *Sedimentation, *Gravity, Separation techniques, *Water quality control, *Water pollution control.
Identifiers: *Water pollution prevention, *Biochemical treatment.

Waste-containing liquor is biochemically treated in a tank or cell by continuously recirculating it through a filter media which is submerged in the liquor while continuously withdrawing a small portion of the liquor. A pressurized column of oxygen-containing gas entrains and lifts the liquid waste through an unobstructed tube and recirculates it horizontally through the filter media. During the lifting process oxygen from the fluid permeates the waste in order to ensure active aerobic metabolism. The tank may be arranged in series with other similar tanks utilizing horizontal flow through the filter media, or one or more of such tanks may be arranged in combination with one or more tanks having vertical flow through the filter media. In the horizontal mode, the waste is in contact with the culture while moving horizontally through the filter media, thus including waste separation by gravity sedimentation in addition to impact removal. (Sinha-OEIS)
W73-11885

MANAGEMENT OF RECYCLED WASTE--PROCESS WATER PONDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering Science.
C. E. Renn.
Copy available from GPO Sup Doc as EP1.23/2:73-223, $0.85; microfiche from NTIS as PB-222 060, $1.45. Environmental Protection Technology Series Report EPA-R2-73-223, May 1973. 49 p, 5 fig, 3 tab, 5 ref. EPA Project WPD 117.

Descriptors: *Water reuse, *Biological treatment, *Water purification, *Aerated lagoons, Waste assimilative capacity, Industrial wastes, Waste water treatment, Industries.

Successful operation is described of a storage pond used to collect treated waste waters and runoff for recycle to manufacturing operations under conditions of drought and severe water shortages. Treated sewage and cafeteria wastes are stored in an air sparger mixed pond and are returned to the manufacturing plant to provide water for evaporative cooling and a variety of production processes. By applying long term storage, air sparger agitation, and controlled stratification during the summer, it has been possible to increase the effectiveness of limited well supplies from six to fifteen times. The efficiency of the pond depends in larger part upon biological processes that go on in the comparatively shallow areas of the system. These act to capture phosphorus and to stabilize algal organics generated in the pond itself. (EPA)
W73-11889

NITROGEN REMOVAL FROM WASTE WATER BY BREAKPOINT CHLORINATION,
Environmental Protection Agency, Washington, D.C. (assignee)
T. A. Pressley, and D. F. Bishop, Jr.
U.S. Patent No 3,732,164, 7 p, 4 fig, 2 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 622, May 8, 1973.

Descriptors: *Patents, *Waste water treatment, *Nutrient removal, Nitrogen, *Chlorination, Ammonia, *Domestic wastes, *Sewage treatment, Chemical reactions, *Pollution abatement, *Water quality control, *Water pollution control.

A method is described for the removal of bound nitrogen from waste water by the use of breakpoint chlorination. (1) Feeding a stream of waste water having an NH3 - N content of about 8 - 30mg./l. to a mixer-reactor; (2) Feed a stream of chlorine material, selected from the group consisting of an alkali metal hypochlorite and free chlorine, to the mixer-reactor in an amount of about 65 - 300 mg./l. of chlorine to provide a ratio of Cl:NH3 of about 8-10:1; (3) Maintain the pH within the mixer-reactor at a value of about 5.8 to 9.5; (4) Thoroughly mix the streams in the mixer-reactor immediately upon the entrance of the streams to the mixer-reactor so as to provide the pH value of about 5.8 to 9.5 uniformly throughout the reactor and to insure a uniform breakpoint chlorination reaction. (Sinha-OEIS)
W73-11890

ACTIVATED SLUDGE SEWAGE TREATMENT PROCESS AND SYSTEM,
Air Products and Chemicals, Inc., Allentown, Pa. (assignee)
M. L. Spector, R. D. Jones, and C. S. McDowell.
U.S. Patent No 3,733,264, 5 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 901, May 15, 1973.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, Aeration, Oxygen, *Pollution abatement, *Water pollution control, *Water quality control, Biochemical oxygen demand.
Identifiers: *Atmospheric air.

This process consists of the following steps: biodegradable waste influent and activated sludge form a mixed liquor which is introduced into a first covered aeration zone; oxygen-rich aeration gas is introduced into this aeration zone; the partially BOD reduced mixed liquor is passed into a subsequent covered aeration zone; a second aeration gas composed of atmospheric air is introduced into the subsequent aeration zone in which the oxygen content is held below 35% by volume until the BOD is reduced to a predetermined level. The system is designed so that between 15 and 95% of the oxygen utilized by the mixed liquor is used in the first aeration zone and the remainder in the second zone. (Sinha-OEIS)
W73-11892

PROCESS FOR COAGULATING AND AGGLOMERATING PARTICULATE MATERIAL WITHIN A LIQUID MEDIA,
J. W. Gooch.
U.S. Patent No 3,733,269, 4 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 903, May 15, 1973.

Descriptors: *Patents, *Water treatment, Chemical reactions, *Coagulation, *Centrifugation, Hydrogen sulfide, Organic wastes, Suspended solids, *Waste water treatment, *Filtration, *Water pollution control, *Water purification, Ammonia, Halogens, Carbon dioxide, Ozone, *Industrial wastes, *Food processing industry, *Pulp and paper industry, *Pollution sources, *Pollution abatement, *Water quality control.
Identifiers: *Chemical treatment, Agglomeration, Decanting, Sulfur dioxide.

A reagent solution is released and dispersed within a waste stream in the form of a microscopically gaseous phase which is adsorbed on the surfaces of the suspended solids and organic waste materials to produce surface characteristics which induce agglomeration and coagulation of the solids. These may be removed by decanting, filtration, or centrifugation. Preferred reagents include ammonia, hydrogen sulfide, halogen compounds, carbon dioxide, sulfure dioxide and ozone. Temperatures from 80 to 700C produce suitable results. Seven examples are cited. (Sinha-OEIS)
W73-11894

METHOD AND APPARATUS FOR ECOLOGICAL RECYCLING OF WASTE PRODUCTS TO PRODUCE FERTILIZER AND GARDEN PLANT NUTRIENTS,
C. H. Carothers.
U.S. Patent No 3,728,254, 6 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 909, No 3, p 1054, April 17, 1973.

Descriptors: *Patents, *Waste treatment, *Waste water treatment, *Aeration, Equipment, Nutrient removal, *Domestic wastes, *Activated sludge, *Pollution abatement, *Water quality control, Water pollution control, Fertilizers, Nutrients, Waste disposal.
Identifiers: Settlement, *Water pollution prevention.

Urban waste is disposed through the utilization of activated sludge, sanitary sewage treatment plants. Solid wastes are comminuted and then introduced into a flowstream passing through sanitary sewage lines being led into a treatment plant. The combined effluent is introduced into conventional aeration tanks which have been modified to provide supplemental aeration. The combined liquor is then removed to a settling tank. A portion of the activated sludge which settles out is returned to the aeration tank to serve as an aeration catalyst, the remainder is removed for processing to convert it for use as a plant food. The final effluent is substantially nutrient free water which may be discharged without damage to environmental water resources. (Sinha-OEIS)
W73-11895

DOMESTIC SEWAGE TREATMENT PLANT,
Sanitary Disposal Systems, Inc., Wheat Ridge, Colo. (assignee)
J. S. Stone.
U.S. Patent No 3,731,812, 9 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 538, May 8, 1973.

Descriptors: *Patents, *Waste water treatment, *Domestic wastes, *Sewage treatment, *Tertiary treatment, *Filtration, Filters, *Aeration, *Aerobic treatment, Pollution abatement, Dissolved oxygen, *Water pollution control, *Water quality control.

A tertiary treatment domestic sewage treatment plant effects particle size reduction by hydraulic action, utilizes extended aeration and adiabatic cooling of the surface of the treating bath to enhance oxygen absorption and is provided with a living filter. The filter differs significantly from the conventional trickling filter in that the flow is reversed, the flow passages are considerably smaller and it is completely submerged. The filter is a living mass, composed of aerobic saprophytic bacteria, fungi, algae, protozoa, crustaceae, rotifera and worms. This mass thrives as a natural ecological succession with a controlled environment. Hydraulic displacement from below furnishes food as finely divided suspended, colloidal and dissolved solids. Continuous aeration from below furnishes dissolved oxygen to assure a completely aerobic process. (Sinha-OEIS)
W73-11897

LIQUID FILTERING APPARATUS,
I. Pistiner.
U.S. Patent No 3,722,682, 5 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 967, March 27, 1973.

Descriptors: *Patents, *Waste water treatment, *Liquid wastes, *Filtration, Filters, *Water treatment, *Water purification, *Pollution abatement, *Water quality control, *Water pollution control.

A self contained liquid filtering apparatus is described. A filtering chamber is provided at the top of an elongated frame structure. This frame structure supports also toggle actuated devices for opening and closing end gates at the open ends of the filtering chamber in order to permit the advancing of a filtering sheet that is taken from a roll supported upon the frame and is drawn by a motorized roller through the end openings of the filtering chamber upon the end gates being lifted by toggle devices. An evacuating apparatus is provided within the frame structure for removing the liquid from the filtering chamber prior to the opening of the end gates and the advancing of the filtering paper from its roll and adapted to return the liquid to the filtering chamber when the new filter area has been provided. The filtered liquid removed from the filtering chamber may be collected in a tank and returned to the filtering chamber so as to be refiltered. Fluid cylinder devices are used for the actuation of the toggle gate operating mechanisms. For the evacuating cylinder device appropriate valves are used in the liquid pipelines to control the flow of the liquid into and out of the filtering chamber. (Sinha-OEIS)
W73-11898

RADIOACTIVE WASTE MANAGEMENT AT HANFORD,
Atlantic Richfield Hanford Co., Richland, Wash.
G. R. Kiel.
Available from NTIS, Springfield, Va., as ARH-SA-113; $4.00 in paper copy, $1.45 in microfiche. Report ARH-SA-113, 1972. 12 p. AEC-AT (45-1)-2130.

Descriptors: *Nuclear wastes, *Waste storage, *Waste disposal, *Washington, Columbia River, Soil properties, Absorption, Ion exchange, Ponding, Waste water disposal, Underground waste disposal, Public health, Seepage, Leakage, Linings, Monitoring.

Efforts are being made to eliminate discharge of radioactivity to soil at Hanford. In the past low-level-liquid waste (process cooling water and laundry waste) was retained in ponds such that the radioisotopes were sorbed by soil beneath the pond. Intermediate-level-liquid waste from chemical reprocessing was largely recycled, but a small part was discharged to long, narrow trenches that were filled with gravel and backfilled with soil. Input was discontinued when ground-water sampling indicated saturation of the soil sorptive capacity. Pending conversion to solid form, high-level waste was stored in underground tanks with leak-detection facilities. (Bopp-ORNL)
W73-11915

SOLIDIFICATION OF MEDIUM ACTIVITY LIQUID RESIDUES WITH BITUMEN (SOLIDIFICTION PAR LE BITUME DE RESIDUS LIQUIDES DE MOYENNE ACTIVITE),
Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
G. Lefillatre, L. Rodi, J. Champeau, R. Hullo, and L. Pecout.
Available from NTIS, Springfield, Va., as CEA-R-4378; $5.45 per copy, $1.45 microfiche. Report CEA-R-4378, Feb. 1973. 90 p, 53 fig, 18 tab, 8 ref.

Descriptors: *Nuclear wastes, *Leaching, *Public health, *Waste treatment, Treatment facilities, Radioactive waste disposal, Feasibility studies, Asphalt, Chemical precipitation, Diatomaceous earth, Laboratory tests, Pilot plants, Radioactivity effects, Burning, Strontium radioisotopes, Methodology.
Identifiers: Cesium radioisotopes.

Several nuclear fuel reprocessing wastes including ion exchange resins and diatomaceous earth were incorporated into asphalt matrixes in pilot-plant studies. Product leachability was reduced by prior coprecipitation with barium sulfate and nickel ferro-cyanide. Asphaltization of coprecipitates from various waste types reduced leachability 10-100 fold. Further treatment of the product by direct-distillation coating with a 6-mm layer of asphalt reduced leachability from about 0.1% after 2 years of immersion in water to zero after 3 years of immersion. Products of low leachability were produced by using aniomic or non-ionic asphalt emulsions or molten asphalt, but a cationic adhesive agent was unfavorable with one waste type. Segregation of the products were studied at elevated temperature, and flammability and radiation stability were tested. (Bopp-ORNL)
W73-11922

AN INVESTIGATION OF TRITIUM DECONTAMINATION,
Florida Univ., Gainesville.
J. A. Wethington, Jr.
Available from NTIS, Springfield, Va., as ORO-4201-2; $4 in paper copy, $1.45 in microfiche. Re-

port ORO-4201-2, 1972. 28 p, 8 tab, 25 ref. AEC AT-(40-1)-4201.

Descriptors: *Tritium, *Isotope studies, *Water pollution treatment, *Catalysts, Water properties, Nuclear wastes, Feasibility studies.

Catalysts for the interchange of the tritium in HTO with methane were tested in connection with potential applications in decontamination of waste water from nuclear or thermonuclear powerplants. In the absence of a catalyst, there was no interchange at 300 C and 3000 psig. Pt on alumina was subject to poisoning, but Rh on alumina was not. Wilkinson's catalyst and certain soluble Pt compounds were considered outstanding. It appeared that certain natural rocks may have catalytic activity, but not two rock samples from the Rio Blanco test site for nuclear stimulation of gas wells. (Bopp-ORNL)
W73-11925

EFFECTS OF ARTIFICIAL AERATION ON THE CHEMISTRY AND ALGAE OF TWO MICHIGAN LAKES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05C.
W73-11958

POLLUTION CONTROL UNDER THE PENNSYLVANIA CLEAN STREAMS LAW,
For primary bibliographic entry see Field 06E.
W73-11976

ENVIRONMENTAL HEALTH (CONSTRUCTION SITE REGULATIONS).
For primary bibliographic entry see Field 06E.
W73-11985

UPPER TRINITY RIVER BASIN COMPREHENSIVE SEWERAGE PLAN, VOLUME III, MANAGEMENT AND FINANCE PROGRAM.
Peat, Marwick, Mitchell and Co., Dallas, Tex.

Descriptors: *Sewerage, *Management, *Financing, *Regional Development, Texas, Administration, Comprehensive planning, Manpower, Personnel, Regulation, Bond issues, Loans, Grants, Investment, Sewage districts.
Identifiers: Upper Trinity River Basin (Texas), *Dallas-Fort Worth (Texas).

A management and financial plan for a regional comprehensive sewerage plan for Upper Trinity River Basin was developed following an engineering study of the area. The engineering report found that total population in this area (the Fort Worth-Dallas, Texas area) was about 2.7 million and is estimated to increase to 7.8 million by 2020. It was reported that about 53 sewage treatment plants operate in the metropolitan Fort Worth-Dallas region. It was recommended that 6 regional plants be constructed in the metropolitan area, that 47 plants be eliminated and that additional plants be constructed outside the metropolitan region. No definite cost data were developed by the previous studies. In this study, organizational and financial arrangements from other parts of the country are examined and recommended systems for the region are described. State and federal agencies would set water treatment standards. Joint systems at the local level are recommended for the operation of the treatment plants controlled by the regional North Central Texas Council of Governments. This organization would establish policy and provide for coordination of water resource development. No new governmental agency would need to be developed. Initial cost would be about $269 million by 1975, increasing to $577 million by the year 2020. Suggested financing includes: (1) municipal revenue bonds, (2) federal grants and (3) state grants. (Poertner)
W73-12010

A WATER AND SEWER PLAN: CLARKE COUNTY, GEORGIA.
Mayes, Sudderth and Etheredge, Inc., Atlanta, Ga.

Northeast Georgia Area Planning and Development Commission, Athens, April 1969. 89 p, 12 fig, 8 tab.

Descriptors: *Comprehensive planning, *Water supply, *Sewerage, *Regional development, Sewers, Water supply development, Data collections, Financing, Georgia, Optimum development plans, Financial feasibility, Forecasting.
Identifiers: *Clarke County (Georgia).

A comprehensive water and sewer plan for Clarke County was developed as part of an area-wide water and sewer plan prepared for the northeast Georgia Area Planning and development Commission. The primary purpose was to develop recommendations for providing water supply and sewer systems to rural areas of the County and incorporated communities under 5,500 population. A large part of Clarke County is considered urban and has been excluded from the study. This leaves only the rural fringe and the community of Winterville, which has 500 residents. Clarke County is located in northeast Georgia, about 70 miles east of Atlanta. Rainfall averages 48 inches per year and average Fahrenheit temperatures range from 46 in December to 79.5 in July with a yearly average of 62 degrees. The total 1960 population was 45,363 and is expected to grow to about 97,000 by 1990. The City of Athens recorded a 1960 population of 31,355 and is the largest urban community. Future population increases are expected mainly in the Athens area and rural areas near Athens. The county has adequate surface water supplies in rivers, but there are no lakes in the County although a reservoir occupying from 12,500 to 25,000 acres has been proposed. Domestic water supplies are obtained from wells and the City of Athens has extended water mains along most of the major and secondary thoroughfares into most parts of the County. The City participates in the cost of installing sewage collection and treatment systems and assumes operation and maintenance of such facilities. Although the water supply system will probably be sufficient for future development, a regional sewerage system plan is recommended. (Poertner)
W73-12013

A WATER AND SEWER PLAN: BARROW COUNTY, GEORGIA.
Mayes, Sudderth and Etheredge, Inc., Atlanta, Ga.

Northeast Georgia Area Planning and Development Commission, Athens, June 1969. 130 p, 26 fig, 8 tab.

Descriptors: *Comprehensive planning, *Water supply, *Sewerage, *Regional development, Sewers, Water supply development, Data collections, Financing, Georgia, Optimum development plans, Financial feasibility, Forecasting.
Identifiers: *Barrow County (Georgia).

A water and sewer plan for Barrow County was prepared as part of a comprehensive water and sewer plan for the Northeast Georgia Area Planning and Development Commission. Financed by the Farmers Home Administration of the USDA, this study focused on rural areas and communities under 5,500 population. Total county population in 1966 was 15,000 and there are five communities with populations between 300 and 5,500 persons. By 1990, the population of the County is expected to increase to between 18,300 and 21,600 persons. Average rainfall is about 44 inches a year, and Fahrenheit temperatures average 44 degrees in the winter and 77 degrees in the summer. Water supplies seem adequate. The Mulberry River is the primary source of municipal water and water wells serve farms in the County. The major water system in the County is located in the City of Winder in the middle of Barrow County. This city, with a 1970 estimated population of 7,500, provides water to the next four largest communities in the County--south, west and east of Winder. Only minor expansion of water delivery service to be recommended for the larger communities and no recommendations are made for the rural areas and small communities. Only one community under 5,500 population has a municipal sewage treatment system. Providing sewerage systems by 1990 is recommended for three other communities, but no recommendations are made for smaller communities or rural areas. (Poertner)
W73-12014

INVENTORY AND ANALYSIS OF EXISTING WATER AND SEWER SYSTEMS AND LONG RANGE WATER AND SEWER PLANS, NATCHEZ, MISSISSIPPI,
Jordan, Kaiser and Sessions, Natchez, Miss.
For primary bibliographic entry see Field 06D.
W73-12015

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME I: GOALS, OBJECTIVES, AND STANDARDS FOR WATERWORKS, SANITARY SEWERAGE, SOLID WASTE MANAGEMENT, STORM DRAINAGE AND FLOOD PLAIN MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
J. A. Elliot, R. L. Waters, and A. D. Desmarais.
Available from the National Technical Information Service as PB-212 429. Gulf Regional Planning Commission, Gulfport, Mississippi, 1972. 181 p, 27 fig, 15 tab.

Descriptors: *Comprehensive planning, *Sewerage, *Sewers, *Solid wastes, *Flood plains, *Urban drainage, *Water works, Mississippi, Standards, Forecasting, Management, Storm water, Data collection, Surveys.

The Gulf Regional Planning Commission's primary goal, in its Urban Systems Engineering Program, is to establish simultaneous criteria, data and evaluation of existing and future anticipated requirements for (1) water supply, (2) sanitary sewerage, (3) solid waste management, (4) storm drainage, and (5) flood plain management. The four-county region of Hancock, Harrison, Jackson, and Pearl River Counties, Mississippi, will develop both short range and long term development plans to meet the needs of the region, integrating the needs to a realistic frame for financial implementation to provide the most efficient means of system improvement, operation, maintenance and management. Regional development policies will be formulated to: (1) control urban growth, (2) prevent fragmentation and duplication of utility systems, (3) encourage economy of development, (4) prevent the overdesign, underdesign or early obsolescence of public utilities, and (5) generally protect the health, safety and welfare of area residents. Regional development of utilities on the basis on natural instead of political boundaries will be encouraged. General policy statements and discussion of goals, objectives and for each area of concern are covered. (Poertner)
W73-12016

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME II: AREA-WIDE WATER AND SANITARY SEWERAGE SYSTEMS,
Diversified Consultants, Inc., Jackson, Miss.
J. A. Elliot, R. L. Waters, and A. D. Desmarais.
Available from the National Technical Information Service as PB-212 430, $31.50 in paper copy, $1.45 in microfiche. Gulf Regional Planning Commission, Gulfport, Mississppi, 1972. 590 p, 101 fig, 111 tab.

Descriptors: *Comprehensive planning, *Sewerage, *Sewers, *Water works, *Data collections, Surveys, Mississippi, Water demand, Water supply, Sewage treatment, Forecasting.

Volume II of this four-volume publication presents an inventory of existing and planned waterworks and sanitary sewerage systems in a four-county (Hancock, Harrison, Jackson and Pearl River) region in Mississippi. It is part of a comprehensive study of the present and future water supply, wastewater treatment, solid waste management, storm drainage and flood plain management requirements for the Gulf Regional Planning Commission. The total planning area is about 2,600 square miles with a 1970 population of 268,000 of which 74 percent is urbanized. Total water consumption is 100 mgd. The major source of water supply is ground water. The shallow aquifers are endangered by possible sea water intrusion. Other pollution problems are present as evidenced by action taken by the United States Environmental Protection Agency in classifying some of the area's water as unsatisfactory for interstate use. Industrial complexes are large water users; two such complexes in Jackson County alone account for the consumption of 55 mgd. Water works and sewerage systems presently in use, and others that are foreseen in the area, are described. (Poertner) (See also W73-12016)
W73-12017

TREATMENT OF PHENOLIC AIRCRAFT PAINT STRIPPING WASTEWATER,
Air Force Weapons Lab., Kirtland AFB, N. Mex.
R. H. Kroop.
Available from NTIS, Springfield, Va 22151 as AD-756-925 Price $3.00 printed copy; $1.45 microfiche. Technical Report No AFWL-TR-72-181, January 1973. 98 p, 33 fig, 15 tab, 37 ref, 3 append.

Descriptors: *Waste water treatment, *Phenols, *Paints, *Activated carbon, Industrial wastes, Biochemical oxygen demand.
Identifiers: Paint stripping.

The optimum treatment process for treating large volumes of phenolic paint stripping waste water was determined. Three processes were selected and tested to determine their effectiveness for the removal of the major contaminants in the waste water. These processes were oxidation with ozone, oxidation with potassium permanganate, and adsorption with granular activated carbon. Granular activated carbon adsorption provided the best removal of the organic contaminants and was also the least expensive. Phenol concentration was reduced from 3000 mg/l to less than 2 mg/l in 60 minutes of contact time. The adsorptive capacity for phenols was 0.404 gm phenols/gm of activated carbon and for chemical oxygen demand, 1.79 gm of COD/gm of activated carbon. (Knapp-USGS)
W73-12037

STUDY - WATER AND SEWER FACILITIES - MOBILE COUNTY.
Converse (J. B.) and Co., Inc., Mobile, Ala.

Prepared for South Alabama Regional Planning Commission, June, 1969. 85 p, 13 fig, 12 tab. HUD Ala. P-32 (G).

Descriptors: *Planning, *Water supply, *Sewerage, Projections, Financing, Cooperation, Costs, Alabama.
Identifiers: Inventories, Mobile County (Alabama), Utility system expansion.

Basically a town by town study of water and sanitary sewer facilities in Mobile County, this study focuses on an inventory of existing facilities and their adequacy and on needed expansions to these systems to 1990 and their associated costs. The future expansions are based on population and land use projections of the South Alabama Regional Planning Commission. Also included in the individual studies are tables of specific proposed improvements with their priority and estimated costs and maps showing the location of the systems. The most significant section deals with the city of Mobile. Mobile and its suburbs have been proceeding separately in their expansion programs and it is recommended that there be more cooperation and less duplication of facilities in the metropolitan area. (Elfers-North Carolina)
W73-12049

POTOMAC ESTUARY WASTEWATER TREATMENT PLANTS SURVEY.
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.

1970 Data Report No 27, 1973. 8 p.

Descriptors: *Water quality, *Water analysis, *Potomac River, *Estuaries, *Chemical analysis, Sampling, Analytical techniques, Nutrients, Carbon, Sewage effluents, Pollutant identification, Water pollution sources.
Identifiers: *Potomac estuary.

In order to obtain more information regarding wastewater characteristics, a 24-hour composite effluent sample from 21 Potomac Estuary sewage treatment plants for a 4-day period, April 12-15, 1970, and a 24-hour sample for September 15, 1970, were obtained. Nutrient as well as carbon analyses were made upon delivery of samples to the Annapolis Field Office. Analytical methods and results are presented for the following parameters: total phosphorus, inorganic phosphorus, total Kjeldahl nitrogrn, nitrate + nitrite, ammonia, total organic carbon, and total carbon. (Woodard-USGS)
W73-12076

CONTINUOUS PILOT PLANT STUDY OF RECYCLING OF FILTER BACKWASH WATER,
Calspan Corp., Buffalo, N.Y. Environmental Systems Dept.
L. Wang, P. E. Pallo, B. J. Schwartz, and B. T. Kown.
Journal of the American Water Waters Association, p 355-358, May 1973. 1 fig, 7 tab, 8 ref.

Descriptors: *Waste water treatment, *Water quality control, *Filters, Coagulation, Filtration, Recycling, Water purification, Chemical precipitation, Turbidity, Sludge treatment.

This article summarizes the results of a pilot plant study on the effects of backwash-water recycling on the filter operation and the plant effluent quality. In this type of operation, the wash water is mixed with raw water near the plant intake at a uniform rate. It is then subjected to the same treatment as the raw water--prechlorination, alum coagulation followed by settling and filtration and post chlorination. Under the condition used in the pilot plant operation, the following advantages of the recycling were observed: an increase in the settling rate of the basin sludge, a decrease in filter head loss, a decrease in pollution caused by discharging filter backwash water into a stream, and recovery and reuse of filter backwash water for the water supply. The disadvantage of the system is that the quantity of alum required may have to be increased slightly. In sum, the recycling method described is feasible and promising and warrants further investigation in a real water plant. (McKnight-Florida)
W73-12192

THE TECHNOLOGY OF SOLID WASTE MANAGEMENT--IMPLICATIONS FOR STATE POLICY.
California Assembly General Research Committee, Sacramento. Assembly Science and Technology Advisory Council.

For primary bibliographic entry see Field 05G.
W73-12193

SEWER AND WATER UTILITY REPORT,
Auburn Planning Board, Maine.
R. F. Cahill.
(1973). 10 p, 4 fig.

Descriptors: *Planning, *Sewage, *Water supply, Land use, *Maine.
Identifiers: Utility extensions, Auburn (Maine), Androscoggin River.

A short planning prospectus is presented for water and sewerage system extension for a small city (approximately 25,000). Some background information on the existing systems, the recent push to clean up the Androscoggin River, and the use of Lake Auburn for water supply, and general areas for water and sewer main extensions including additions to outlying industrial areas are discussed. Water main extensions should be limited to areas that will also be served by sewers in order to prevent septic tank problems. A key feature in the expansion of the sewerage system is a new treatment plant being constructed jointly by Auburn and Lewiston, since the construction of a joint facility proved to be more economically feasible than would a separate system for each city. Proposed extension maps are included. (Elfers-North Carolina)
W73-12236

SEWERAGE SYSTEMS REPORT: SOMERSET COUNTY, N.J.
Somerset County Planning Board, N.J.

March, 1972. 71 p, 2 maps, 1 append.

Descriptors: *Sewerage, Treatment facilities, Planning, Coordination, Land use, *New Jersey.
Identifiers: *Somerset County (New Jersey), Inventories, Sewerage authorities, Middlesex County (New Jersey), Raritan River.

An inventory is presented of existing sanitary sewerage facilities in Somerset County; it covers twenty-one cities and townships within the county and three regional sewerage authorities. Each sewerage system in the county is discussed in some detail and various tables are included which cover such features as level of treatment, wastewater flow, types of wastes handled, and length of sewer lines. The county has a long history of providing sanitary sewers and using coordinated systems and planning. This is partly the case because of the great need for wastewater disposal caused by the high levels of urbanization and industrialization in parts of the county. The Somerset County Master Plan for land use calls for large areas of the county to remain in low density development and this will be closely related to the future provision and location of sanitary sewers. (Elfers-North Carolina)
W73-12237

ENVIRONMENTAL STATEMENT, RIO BLANCO GAS STIMULATION PROJECT, RIO BLANCO COUNTY, COLORADO.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-12258

RECYCLING SLUDGE AND SEWAGE EFFLUENT BY LAND DISPOSAL.

Environmental Science and Technology, Vol 6, No 10, p 871-873, October 1972. 2 fig, 3 photo.

Descriptors: *Sewage sludge, *Sewage effluents, *Land reclamation, *Sewage disposal, Spraying, Groundwater recharge, Land management, Crop production, Sprinkler irrigation, Waste water disposal, Water reuse, Strip mines, Forests,

Farms, Grasslands, Deserts, Waste water treatment, Irrigation, Sludge, *Sludge disposal, Sanitary engineering.
Identifiers: *Land disposal.

As an alternative to other advanced waste treatment systems, land disposal of treated sewage and sludge shows a great deal of promise. Many municipal, state, and federal agencies are either experimenting with or planning projects for sewage and sludge disposal on forest, cropland, or wasteland. Land disposal is based on the living filter concept--letting nature recycle nutrients and water beneficially on land rather than detrimentally through streams and lakes. Land disposal is characterized by spray irrigation or application of sewage effluent or sludge slurry in predetermined rates and amounts. The key to maximum use of the soil filter is water management and movement. Clogging or standing water will deter the filter and cause runoff. The ability of soil to handle nitrogen is the primary limiting factor for land disposal of sludge; phosphorus is involved as a second limiting factor. Several hydrogeologic factors that must be considered when selecting sites for land disposal are discussed. (USBR)
W73-12334

5E. Ultimate Disposal of Wastes

FINAL DISPOSAL OF EFFLUENT BRINES FROM INLAND DESALTING PLANTS,
Dow Chemical Co., Freeport Tex.
J. R. Booth, Jr., B. P. Shepherd, and W. F. McIlhenny.
Available from the National Technical Information Service as PB-218 432, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Research and Development Progress Report No 817, May 1972. 181 p, 37 fig, 13 tab, 40 ref. 14-30-2830.

Descriptors: *Brine disposal, *Desalination, *Deep wells, *Reverse osmosis, Crystallization, Environmental effects, Effluents, *Ultimate disposal.
Identifiers: Disposal methods, Subsurface injection, Site stockpile, Typical sites, Pipeline disposal, Solar ponds.

Methods of final disposal of inland desalination plant effluent brines were investigated. Within legal, ecological and environmental constraints, and using a representative range of brackish water compositions, geographical distribution, geological formations and other such factors, a technical and economic evaluation of all practical methods of final disposal was made using a systems approach. This was illustrated by six case studies. Generalized cost ranges for the component subsystems were prepared for use in approximating systems costs and identifying the least-cost disposal method for use with other specific cases. The study showed that: (1) subsurface injection of waste brines is generally less costly than other methods of final disposal; (2) discharge of waste brines into the sea preceded by pipelining more than 70 miles is not economically sound; (3) electrodialysis is the most economical method of concentrating the effluent brine to 20 percent total dissolved solids at 4.0-MGD product water rate, while solar evaporation is the most economical at the 0.4-MGD rate and solar evaporation is the most economical method of reducing a 20 percent brine to bulk dry solids. (OSW)
W73-11749

FEEDLOT WASTE UTILIZED EFFICIENTLY BY ANIMALS.
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 05B.
W73-11762

SOLID WASTE MANAGEMENT FOR CATTLE FEEDLOTS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W73-11766

THE OPCCO DRYER.
For primary bibliographic entry see Field 05D.
W73-11771

THE GREAT MANURE DILEMMA,
J. Gerstner.
The Furrow, p 1-2, September/October, 1970.

Descriptors: *Waste disposal, Waste treatment, Recycling, *Farm wastes, Livestock.

Disposing of animal wastes cheaply and without pollution is fast becoming one of agriculture's knottiest problems. United States livestock produce about two billion tons of liquid and solid wastes per year, enough to fill a square mile 10 feet high every day. Complicating the state of overproduction is the development of cheap commercial fertilizer. The large differences in livestock operations make one ultimate solution to manure handling doubtful, if not impossible. The characteristics of manure change with the type of animal, feed, and climate. The requirements for practical disposal vary with the operation's size, location, and amount of land available. Some methods being developed are: feeding processed manure to livestock, burying effluent, spreading and deodorizing it, and selling it. The animal waste problem is likely to prove less technical than economic. (Wetherill-East Central)
W73-11773

FEED RECYCLING SHOWING PROMISE.
Calf News, Vol 11, No 1, p 28-29, 52, January 1973.

Descriptors: Feed lots, *Farm wastes, *Recycling, *Feeds, Equipment, California, Feeds.

This is a progress report on the Feed Recycling Company, a company selling equipment that takes manure from feedlots and converts it into feeds. The equipment is capable of converting a ton of manure into sugars, fibers, and 400 pounds of protein. Initial cost for the unit is $180,000 and operating costs are five dollars a ton. The end product is worth thirteen cents a pound, which could mean returns up to $600,000 a year for wastes from a feedlot. Feeding tests for the feed are now being run at a California research station. (Marquard-East Central)
W73-11782

FEED 'EM TRASH, CUT POLLUTION.
For primary bibliographic entry see Field 05D.
W73-11789

SUBSURFACE INDUSTRIAL WASTE WATER INJECTION IN ILLINOIS,
Ohio River Valley Sanitation Commission, Cincinnati. Committee on Subsurface Industrial Waste Water Injection.
D. L. Warner.
Available from NTIS, Springfield, Va 22151 as PB-214 269 Price $3.00 printed copy; $1.45 microfiche. Illinois Institute for Environmental Quality Document No. 72-2, February 1972. 133p, 8 fig, 11 tab, 7 ref, 5 append.

Descriptors: *Waste disposal wells, *Injection wells, *Illinois, Regulation, Legal aspects, Underground waste disposal, Waste water disposal, Industrial wastes.

Five waste-disposal wells have been drilled in Illinois. Four of these are operating. The justification for use of industrial waste water injection is that only limited alternatives are available for certain types of waste waters. The major areas of technologic concern in evaluating the feasibility of waste water injection are the geology and subsurface hydrology of the region and the well site, and the character and volume of the waste water. All of Illinois is underlain by sedimentary rocks, and in much of the State geologic conditions are suitable for waste water injection. The absence of suitable injection horizons in northern Illinois and complex geologic conditions in southern Illinois limit the potential for waste water injection in those areas. The presence of inadequately plugged abandoned oil and gas wells restricts the use of the shallower zones within the Illinois basin. It is recommended that the roles of the various State agencies in regulation of waste water injection be well defined, and a pattern for interagency action is delineated. The Environmental Protection Agency should have the principal regulatory responsibility with the Department of Mines and Minerals, the Geological Survey, the Water Survey, and the Health Department also participating. (Knapp-USGS)
W73-11820

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME III: AREA-WIDE SOLID WASTE MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
J. A. Elliott, R. L. Waters, and A. D. Desmarais.
Available from the National Technical Information Service as PB-212 431. Gulf Regional Planning Commission, Gulfport, Mississippi, 1972. 253 p, 12 fig, 61 tab.

Descriptors: *Solid wastes, *Comprehensive planning, *Municipal wastes, Regional analysis, Forecasting, Data collections, Surveys.

Solid waste management for the Gulf Regional Planning Commission jurisdiction is reported as part of a comprehensive study of problems of waterworks, sanitary sewerage, solid waste management, storm drainage and flood plain management. Three basic areas of concern are outlined in the study. In this first section an inventory and analysis is made of existing solid waste disposal facilities, evaluated with respect to their ability to serve existing and projected needs. The second section is divided into two sub-sections; the first dealing with the regional concept of solid waste management, the second dealing with guidelines for local management of solid wastes. The third area of concern is a solid waste disposal plan which deals with forecasts of future quantities of solid waste, recommended location and size of proposed landfill areas and a recommended plan of implementation. Four goals recommended for proper handling of solid wastes are: (1) the establishment of regional authorities to handle solid waste management for a short term solution, (2) utilization of state funds to operate regional solid waste management systems for the long term solutions, (3) realignment of the economy and industry to recycle and reuse material resources, and (4) incorporation of reuse and recycling into the initial design of products. These goals should be implemented on a national level as well as on the local level. (Poertner) (See also W73-12016)
W73-12018

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS: VOLUME I,
Missouri Univ., Rolla. Dept. of Geological Engineering.
D. L. Warner.
Available from NTIS, Springfield, Va. 22151 as AD-756 641, Price $9.00 printed copy; $1.45 microfiche. Final Technical Report, June 1972. 675 p. USGS 14-01-001-12280.

Descriptors: *Waste disposal wells, *Disposal, *Injection wells, Alabama, California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Industrial wastes.

This report consists of 246 forms describing individual wastewater injection wells that have been inventoried. A table lists the 22 states in which wells are known to exist and the number of wells inventoried. The forms are grouped by state and arranged approximately chronologically within each state. All wells that have been constructed for injection of industrial wastewaters into saline water aquifers were included. In addition to operative wells, some of the wells in the survey have never been operated; others have been operated, but are now inactive or abandoned. Oilfield brine injection wells are not included, nor are wells used exclusively for injection of sewage effluent. Volume 1 contains information for Alabama, California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, and Louisiana. (Knapp-USGS)
W73-12051

GEOLOGY FOR PLANNING IN ST. CLAIR COUNTY, ILLINOIS.
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02F.
W73-12069

ENVIRONMENTAL STATEMENT, RIO BLANCO GAS STIMULATION PROJECT, RIO BLANCO COUNTY, COLORADO.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-12258

DISPOSITION OF SPOIL ON THE DUMP SITE,
Rhode Island Univ., Kingston.
S. B. Saila, and S. D. Pratt.
In: Dredge Spoil Disposal in Rhode Island Sound, Rhode Island University Marine Technical Report No 2, Kingston, p 7-14, 1972. 18 fig.

Descriptors: *Dredging, *Desilting, *Waste disposal, *Sounds, *Bathymetry, Contrours, Sediment distribution, Distributions patterns, Sediment transport, Channel improvement, Navigation, Estuaries.
Identifiers: *Rhode Island Sound, Providence River (R I), Dredging spoils.

Between December 1967 and September 1970 a total of 8.2 million cubic yards of dredge spoil from the Providence River was deposited on an offshore site in Rhode Island Sound. In October 1970 divers made direct observations of topographic features, animal life, and sediment variability in the area of active dumping in order to obtain information to properly interpret bathymetric records and grab samples from the area. Within the limits of the precision of bathymetric surveys, the volume of spoil on the disposal area was the same as that reported dumped; no large-scale loss had taken place during or after the dumping operation. The presence of a layer of incohesive silt/clay on the spoil surface during the summer indicated a nonerosive physical environment during that period. The combined effect of dumping pattern, sediment properties, and hydrographic variables has produced a low cone of spoil approximately 1 mile in diameter, indicating that the 1-square-mile assigned dumping area was of adequate size. (See also W73-09142) (Woodard-USGS)
W73-12318

SEDIMENTS OF THE DREDGING AND DISPOSAL AREAS,
Rhode Island Univ., Kingston.
S. D. Pratt.
In: Dredge Spoil Disposal in Rhode Island Sound, Rhode Island University Marine Technical Report No 2, Kingston, p 15-18, 1972. 2 fig.

Descriptors: *Dredging, *Desilting, *Waste disposal, *Sediment distribution, *Sounds, Sediment transport, Correlation analysis, Sediments, Shellfish, Channel improvement, Navigation, Estuaries.
Identifiers: *Rhode Island Sound, Providence River (R I), Dredging spoils.

Between December 1967 and September 1970 a total of 8.2 million cubic yards of dredge spoil from the Providence River was deposited on an offshore site in Rhode Island Sound. The sediments encountered in this study are described to provide a basis for distinguishing spoil materials from natural sediments, predicting the stability of the spoil under the hydrographic conditions of Rhode Island Sound, and studying animal-sediment relationships. Although much of the spoil had a smaller median-grain size and a higher percentage of organic matter than the natural sediments in the dumping area, these were not always distinguising characteristics. Poor sorting and the presence of the shells of estuarine mollusks were more reliable indicators. The presence of clay, pebbles, plant detritus, oil globules, and gray or black color also identified spoil. (See also W73-09142) (Woodard-USGS)
W73-12319

CHARACTERISTICS OF THE PHYSICAL ENVIRONMENT,
Rhode Island Univ., Kingston.
T. T. Polgar.
In: Dredge Spoil Disposal in Rhode Island Sound, Rhode Island University Marine Technical Report No 2, Kingston, p 19-26, 1972. 5 fig.

Descriptors: *Dredging, *Desilting, *Waste disposal, *Sounds, *Sediment distribution, Currents (Water), Sediment transport, Distribution patterns, Seasonal, Measurement, Current meters, Data collections, Beaches, Channel improvement, Estuaries.
Identifiers: *Rhode Island Sound, Providence River (R I), Dredging spoils.

Between December 1967 and September 1970 a total of 8.2 million cubic yards of dredge spoil from the Providence River was deposited on an offshore site in Rhode Island Sound. Examination of the current and wave regimes of the physical environment in the dump site area provides some useful conclusions regarding the disposition of dumped sediments. Currents in the dump site region are dominated by the semi-diurnal tide. Instantaneous bottom currents rarely exceed 0.3 knots, whereas the net tidal transport velocity is no greater than 0.1 knots. Currents alone are not effective in resuspending sediments. During a significant portion of the year waves in the area could develop bottom velocities sufficient for the resuspension (erosion) of unconsolidated sediments. The mode of deposition and mechanical characteristics of dredged materials apparently results in an erosion-resistant deposition. The dumped material cannot be considered unconsolidated, and theoretical predictions based on the behavior of unconsolidated sediments are not applicable. Beaches in the region will probably remain free of dredge spoil traces from the dump site. (See also W73-09142) (Woodard-USGS)
W73-12320

5F. Water Treatment and Quality Alteration

A SURVEY OF DISPERSION COEFFICIENTS FOR ESTIMATING POLLUTANT TRANSPORT,
Grumman Aerospace Corp., Bethpage, N. Y.
For primary bibliographic entry see Field 05B.
W73-11814

METHOD OF PURIFYING WATER,
Aktiebolaget Atomenergi, Stockholm (Sweden). (assignee)
S. H. Ahrland, B. G. F. Carleson, and J. S. Lindhe.
U.S. Patent No. 3,730,886, 3 p, 2 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, p 290, May 1, 1973.

Descriptors: *Patents, *Water purification, *Phosphates, Zirconium, *Water treatment, Cooling water, Nuclear reactors.

The primary object is to effect a method of purifying water which can be used for water having a high temperature and which results in water having an extremely low percentage of foreign anions and cations and having a pH value near 8, preferably 6 - 8. The water is treated with zirconium phosphate and then with zirconium hydroxide which removes the phosphate ions. The hydroxide is precipitated with ammonia and the precipitated zirconium hydroxide is then treated with a water solution of ammonia. (Sinha-OEIS)
W73-11881

WATER PURIFICATION,
Texaco, Inc., New York. (assignee)
H. V. Hess, and F. E. Guptill, Jr.
U.S. Patent No 3,731,801, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 535, May 8, 1973.

Descriptors: *Patents, *Demineralization, *Water purification, *Water treatment, Brackish water, Sea water, *Desalination, Scaling, Corrosion, Minerals, Hardness (Water), *Water quality control.

Mineral constituents whose solubility varies inversely with temperature are removed. The water temperature is raised by direct contact with a preheated stream of liquid hydrocarbon oil to a temperature which is sufficient to precipitate the minerals but below the temperature at which the hot oil will extract water, and at a pressure sufficient to keep the oil and water in the liquid phase. The precipitated minerals may be mechanically separated. The oil and water phases separate in one decanter, and the minerals tend to settle as a gelatinous floc at the bottom of the decanter from which the floc may be drawn off. In a second decanter, separation of oil and water again takes place and the remaining minerals settle to the bottom. When the minerals and oil have been removed, the purified water is ready for use. (Sinha-OEIS)
W73-11896

ENVIRONMENTAL HEALTH (CONSTRUCTION SITE REGULATIONS).
For primary bibliographic entry see Field 06E.
W73-11985

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME I: GOALS, OBJECTIVES, AND STANDARDS FOR WATERWORKS, SANITARY SEWERAGE, SOLID WASTE MANAGEMENT, STORM DRAINAGE AND FLOOD PLAIN MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 05D.
W73-12016

ENTOMOLOGICAL SPECIAL STUDY NO. 44--013-72/73, LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYETHYLENE FORMULATIONS OF CHLORPYRIFOS, DECEMBER 1971-APRIL 1972,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
M. A. Lawson.
Available from NTIS, Springfield, Va. 22151, as AD-755 517, Price $3.00 printed copy; $1.45 microfiche. Report, 1972. 10 p, 4 fig, 3 ref, 2 append.

Descriptors: *Water pollution control, *Pesticides, *Water chemistry, *Chemical reactions, Laboratory tests, Pesticide residues, Plastics, Water treatment, Entomology, Insect control.
Identifiers: *Chlorpyrifos, Chlorinated polyethylene.

Laboratory evaluations were conducted for 16 weeks to compare, under static conditions, residue levels maintained in water treated with three chlorinated polyethylene pellet formulations of chlorpyrifos (0,0-diethyl 0- (3,5,6-trichloro-2-pyridyl) phosphorothioate). All pellets were cylindrical in shape and had a specific gravity > 1.0. Each formulation was evaluated at dosages of 0.25, 0.5 ppm in one gallon glass jars containing three liters of distilled water. Treatments and controls were replicated three times. Water samples were removed from the jars weekly, partitioned with hexane, and subjected to electron capture gas chromatographic analysis to determine chlorpyrifos residues. Data were subjected to three-way analysis of variance to determine effects of formulation, dosage, week after treatment, and the interactions thereof, on residues maintained in the water. Peak residue levels occurred within seven to ten weeks after treatment for all formulations at each dosage. A gradually decreasing trend in residues began after ten weeks for all formulations. Higher dosages resulted in significantly higher residue levels during each week of the study. There were no significant differences among the three formulations in the amount of residues maintained in the water during the 16-week test. (Woodard-USGS)
W73-12042

STUDY - WATER AND SEWER FACILITIES - MOBILE COUNTY.
Converse (J. B.) and Co., Inc., Mobile, Ala.
For primary bibliographic entry see Field 05D.
W73-12049

VIRUS IN WATER: II. EVALUATION OF MEMBRANE CARTRIDGE FILTERS FOR RECOVERING LOW MULTIPLICITIES OF POLIOVIRUS FROM WATER,
Gulf Coast Water Hygiene Lab., Dauphin Island, Ala.
W. F. Hill, Jr., E. W. Akin, W. H. Benton, and T. G. Metcalf.
Appl Microbiol. Vol 23, No 5, p 880-888. 1972. Illus.
Identifiers: *Filters (Membrane cartridge), Multiplicities, *Poliovirus, Virus, *Water treatment.

The efficiency of a Millitube MF cartridge filter, a membrane filter, for recovery of poliovirus from 100-gal volumes of both fresh (tap) and estuarine water was determined. In the high multiplicity of virus input-output experiments, recovery of 97% or greater of input virus was achieved in both types of water when the final concentration of divalent cation as Mg2+ was 1200 microgram/ml and the pH was 4.5. Virus was effectively eluted from the membrane cartridge with 5 times nutrient broth in 0.05 M carbonate-bicarbonate buffer at pH 9.0. Four elutions of 250 ml each were used. In the low multiplicity of virus input-output experiments under the same cationic and pH conditions, up to 67% of the input virus was recovered when the virus was further concentrated from the eluates by the aqueous polymer 2-phase separation technique. The volume reduction was 126,000-190,000 to 1. The use of the combined techniques, i.e., membrane adsorption followed by aqueous polymer 2-phase separation, provided a highly sensitive, simple, and remarkably reliable sequential methodology for the quantitative recovery of poliovirus occurring at multiplicities as low as 1 to 2 plaque-forming units/5 gal of water.--Copyright 1972, Biological Abstracts, Inc.
W73-12187

PREVENTING FILAMENTOUS SCALE IN WELL WATER,
Sayreville Water Works, N.J.
A. Piatek.
Water and Wastes Engineering, Vol 4, No 12, p 54-55, December 1967, 9 ref.

Descriptors: *Water treatment, *Groundwater, *Iron bacteria, *Wells, *Corrosion, Phosphates.
Identifiers: Pumping efficiency, Sulfamic acid.

Growths of iron bacteria plugged an 8-in. line and well casings. A system of chemical treatment has been found effective in preventing the formation of filamentous scale and also apparently reducing the level of corrosion. The well is surged with a solution of calgon (100 lb. per 50 gal. of water); then 5 lb of HTH (calcium hypochlorite) (dissolved in 5 gal. water) is added, and surged to mix. 15 gal Anthium Dioxcide (Chlorine dioxide) is added, the total mixture is surged for 2 hrs. (15 min. on and 15 min. off), then allowed to stand overnight. The well content is pumped into the 3,000-ft. 8-in.-diameter line to the treatment plant then (after standing overnight) flushed back to waste. An inhibited sulfamic acid is introduced to the well and another backflush is performed. Treatment every two months is required to maintain pumping efficiency. (Bean-AWWARF)
W73-12188

CONTINUOUS ION EXCHANGE SOFTENING,
Permutit Co., Paramus, N.J.
G. Alexander.
Water and Wastes Engineering, Vol 6, No 1, p 28-29, January 1969. 2 fig.

Descriptors: *Water treatment, Water quality, *Water softening, Hardness (Water), *Ion exchange, *Resins.
Identifiers: *Countercurrent ion exchange.

Continuous countercurrent ion exchange for water softening is applicable to both water and waste water treatment. The equipment in the system has been developed to provide efficient and simple operation in softening municipal water supplies. The Permutit CCIX system for this application is described. During the softening cycle, the raw water flows upward and the resin moves downward in a countercurrent direction. When the water and the resin are in contact, magnesium and calcium ions are exchanged for sodium ions on the resin. Normally when the resin becomes partially exhausted it does not remove all the calcium and magnesium ions and there is a leakage of some hardness through the resin. In the continuous countercurrent system, however, the last resin to contact the water is always the most completely regenerated; therefore minimum leakage occurs. Removal of exhausted resin from the bottom of the vessel and replacement with fully regenerated resin at the top maintains this highly efficient softening cycle. (Bean-AWWARF)
W73-12189

ADSORPTION AND FILTRATION WITH GRANULAR ACTIVATED CARBON,
Calgon Corp., Pittsburgh, Pa.
D. G. Hager.
Water and Wastes Engineering, Vol 6, No 8, p 39-43, August 1969. 6 fig, 2 tab, 7 ref.

Descriptors: *Water treatment, *Activated carbon, Efficiencies, Adsorption, Filtration, Performance, Carbon filters.
Identifiers: *Carbon reactivation.

Granular activated carbon beds, coupled with periodic reactivation of the carbon, offer removal efficiency with both theoretical and practical advantages. In the treatment of water and wastes, granular carbon demonstrates utility for simultaneous adsorption, filtration, and removal of excess oxidants. The application of granular activated carbon to potable water treatment is described and performance results in municipal water installations in England, Germany and the United States are reviewed. (Bean-AWWARF)
W73-12190

CONTINUOUS PILOT PLANT STUDY OF RECYCLING OF FILTER BACKWASH WATER,
Calspan Corp., Buffalo, N.Y. Environmental Systems Dept.
For primary bibliographic entry see Field 05D.
W73-12192

SAFE DRINKING WATER.
For primary bibliographic entry see Field 05G.
W73-12205

5G. Water Quality Control

METROPOLITAN WATER INTELLIGENCE SYSTEMS - COMPLETION REPORT, PHASE II,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, J. W. Labadie, G. L. Smith, D. W. Hill, and B. H. Bradford.
Available from the National Technical Information Service as PB-221 992, $6.00 in paper copy, $1.45 in microfiche. Water Resource Systems Program Completion Report, June 1973, 155 p, 20 fig, 61 ref, 1 append. OWRR-C-3105 (No 3685) (1). 14-31-0001-3685.

Descriptors: *Control systems, *Sewers, *Storm runoff, *Overflow, *Optimization, Water pollution control, Storage, Reservoir operation, Mathematical models, Dynamic programming, Automatic control, *Combined sewers.
Identifiers: *Mathematical programming, Optimal control theory, Control logic.

The results of Phase II of the project 'Metropolitan Water Intelligence Systems' (MWIS) are reported. The special type of MWIS considered is the fully automated control system for combined sewer systems. Technical data are presented on computer and control equipment, on the formulation, on the control strategy problem and on optimization techniques for developing control logic. The Real-Time Automation and Control System (RTACS) Model is presented as a simulation model which can be used off-line to develop control logic. The hydrologic, hydraulic and control models needed in either an RTACS or an RTACS Model are discussed. The socio-political problems associated with implementing a MWIS are related to similar problems experienced in implementing any information system or automation effort. The problems facing local decision makers who must comply with shifting standards under heavy time, technological, financial and political constraints are related to their personal objectives. Proposals are advanced for social modeling techniques which could help in MWIS implementation.
W73-11704

CONFINEMENT FEEDING - PROS, CONS, AND TIPS,
Illinois Univ., Urbana.
D. G. Jedele.
Feedlot Management, Vol 13, No 1, p 21-23, January, 1971.

Descriptors: Runoff, Water pollution, Air pollution, Performance, *Feedlots, *Farm wastes, Illinois, *Confinement pens.

Advantages and disadvantages of confinement feeding are described. Aspects the feeder should investigate before beginning construction of confinement buildings are discussed. (Fomby-East Central)

W73-11763

POLLUTION CRACKDOWN.
The Furrow, p 4. September/October, 1970.

Descriptors: *Feed lots, *Regulation, Waste disposal, Recycling, *Farm wastes, Legal aspects, Livestock.

Cattle feeder George Reynolds was one of many stockmen forced to move farther away from expanding city limits. Many, like James Sinning, have faced law suits as high as $90,000 from people who moved next door after their feedlots had been established. Some stockmen are working with authorities to prevent embarrassing or costly law suits in the future. Lawsuit tips. Locate feedlots away from neighbors and streams. Ag engineer E. H. Davis says, 'Try to make friends with your neighbor, so you understand his problems and he understands yours.' (Wetherill-East Central)
W73-11785

REGISTRATION IS REQUIRED AS GOVERNMENT MOVES TO CONTROL WATER POLLUTION FROM LARGE FEEDLOTS,
J. Richter.
Beef, p 20. July, 1971.

Descriptors: *Feed lots, *Waste disposal, Farm wastes, Legal aspects, Water pollution control.
Identifiers: *Registration.

As of July 1, 1971, feedlots with over 1,000 head must apply for permits to discharge effluents into waterways. Smaller units, those that don't discharge from a single point source, or those that are in states of tougher control do not have to register. Agencies involved are the EPA and the Army Corp of Engineers working with the Refuse Act of 1899. (Marquard-East Central)
W73-11786

ENGINEER SAYS FEEDERS CAN HANDLE MOST POLLUTION CONTROL PRACTICES.

Beef, p 15. July, 1971.

Descriptors: *Feed lots, Runoff, *Farm wastes, Water pollution control, Nebraska.

75% of feedlot pollution problems can be controlled by the individual. Small operators can receive help from the Soil Conservation Service while large operators must go to engineers to solve the other 25%. Nine suggestions are offered for control of runoff. (Marquard-East Central)
W73-11788

EROSION PREVENTION DURING HIGHWAY CONSTRUCTION BY THE USE OF SPRAYED ON CHEMICALS,
Virginia Highway Research Council, Charlottesville.
D. C. Wyant, W. C. Sherwood, and H. N. Walker.
Available from NTIS, Springfield, Va 22151 as PB-213 207, Price $3.00 printed copy, $1.45 microfiche. Report 72-R1, July 31, 1972. 37 p, 4 fig, 11 plate, 15 tab, 18 ref, append.

Descriptors: *Erosion control, *Bank protection, *Coatings, *Roadbanks, Virginia, Soil erosion, Slope protection, Coal tar coatings, Plastics.

The erosion inhibiting potential of nine commercial plastic chemicals was evaluated. All chemicals were also compared with the conventional method of straw tacked with an asphalt emulsion, and with untreated soil. In Virginia there are three principal physiographic provinces. The soils in each province are significantly different in composition and erodibility. In each area two highway slopes with a vertical height of 15 to 20 feet and a slope of approximately 2:1 were selected to be tested. The same chemicals were not the most effective in all areas. Also, no chemical performed better than the conventional method in any area. Some of the chemicals in some soils even promoted erosion. In the Ridge and Valley physiographic province, Petroset SB and Soil Gard were the most effective. For the soils in the Piedmont physiographic province, none of the chemicals performed well. In the sandy soils of the Coastal Plain physiographic province, Petroset SB and straight asphalt emulsion were very effective. Both are more expensive than, but about equal in effectiveness to, the conventional straw-asphalt method. (Knapp-USGS)
W73-11855

OIL SKIMMING APPARATUS,
C. Damberger.
U.S. Patent No 3,726,406, 4 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 2, p 593, April 10, 1973.

Descriptors: *Patents, Skimming, Equipment, *Oil spills, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollution control.
Identifiers: Oil booms, *Water pollution prevention.

The oil slick is drawn into the skimmer by a cable water fence gathered by boat equipment and drawn toward the skimmer body. The fence is made up of a series of floatable blocks that connect by pin opening and locking devices. The skimmer may be a hopper or funnel shaped body closed at its bottom end and open at its top. Hot water is directed against the underside of the oil slick to make the oil pass more readily over a float and into the skimmer body. The hot water hose is connected to a vacuum pump. The heated oily water is delivered to a separator from which the separated oil is moved to a storage tank. The apparatus may be adapted for use about an oil derrick or oil tanker to contain lost oil. (Sinha-OEIS)
W73-11873

METHOD AND APPARATUS FOR SEPARATING WATER FROM A MIXTURE OF A GRANULAR MATERIAL AND WATER,
Maschinenfabrik Buackau R. Wolf A.G., Munich (West Germany). (assignee)
K. Pause, and H. Buzga.
U.S. Patent No 3,730,343, 7 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, p 161, May 1, 1973.

Descriptors: *Patents, *Water treatment, *Centrifugation, Granules, *Evaporation, Equipment, Separation techniques, *Water quality control.
Identifiers: Centrifuges.

A centrifuge is described for separating water from a mixture of granular material and water. Water not retained by the granular material is separated by flowing through a screen by the action of gravity. Within the centrifuge there are zigzag-shaped radial channels and slanted screens. Water which adheres to the granular material is evaporated by streams of air blowing into the outer end of the zigzag-shaped channel and into a discharge duct for transporting the granular material while evaporation of remaining water continues. (Sinha-OEIS)
W73-11875

SKIMMING SYSTEM,
C. H. Prewitt.
U.S. Patent No 3,730,346, 5 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 910, No 1, p 162, May 1, 1973.

Descriptors: *Patents, *Oil pollution, *Oil spills, Skimming, *Pollution abatement, *Water pollution control, *Water quality control, Separation techniques, Equipment.
Identifiers: *Water pollution prevention.

This system consists of an oil skimming unit, which is self-propelled but tethered to the mother craft, and has flexible conduits to transfer fluid to the mother craft where it is separated. The skimmer has an elongated trough extending laterally of the path along which the unit is propelled. The trough has forward and aft horizontal edges lying in the same horizontal plane to avoid creating a bow wave condition and allow the floating fluid to be drawn into the trough across both foreward and aft edges. A submersible pump coupled to the skimming unit permits the conduct of fluid to the mother craft by positive pressure rather than suction. The output of the pump is controlled. An automatic adjustment of fluid volume prevents the unit from floating too high or sinking too low by virtue of the weight of the fluid contained in the trough supplementing the pumping rate adjustment. (Sinha-OEIS)
W73-11876

OIL CONTAINMENT BOOM,
Reynolds Submarine Services Corp., Miami, Fla. (assignee)
A. L. Markel, and J. R. R. Harter.
U. S. Patent No 3,731,491, 3 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 455, May 8, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, *Water quality control, Equipment, *Pollution abatement.
Identifiers: Oil containment, *Water pollution prevention.

An oil containment boom is formed into an elongated strip of corrugated metal by securing together sections of corrugated sheet metal in end-to-end fashion. The corrugations in the aluminum sheet material are oriented vertically to provide floating flexibility in both the vertical and horizontal planes. Weights may be attached to the corrugated metal strip to vary the freeboard height of the floating boom. For use in rough sea conditions, small light weight stabilizer or outrigger floats may be bolted to the boom to provide further reserve flotation and a righting moment arm to each side of the boom. The stabilizer or outrigger floats may attached at regular intervals such as 6 foot intervals. (Sinha-OEIS)
W73-11882

METHOD FOR REMOVING OIL AND DEBRIS FROM WATER,
Standard Oil Co., Chicago, Ill. (assignee)
J. F. Grutsch, and R. C. Mallatt.
U.S. Patent No 3,732,161, 2 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 621, May 8, 1973.

Descriptors: *Patents, *Flotsam, *Oil spill, *Oil pollution, Equipment, *Filtration, *Pollution abatement, Filters, *Water quality control, *Water pollution control, Slime.
Identifiers: Polyurethane, *Water pollution prevention.

Buckets are attached to an endless chain which moves through a closed loop path. The buckets catch debris and as they rise on the loop they dump the debris or oil into a holding bin. The endless chain is made up a series of interconnected foraminous chambers holding a regenerable porous filter material such as polyurethane. Preferably the filter material will have an outer large pore section and an inner small pore section. As the chain moves the filter material absorbs surface and subsurface oil from the water passing through the filter material. The filter material is regenerated by squeezing the filter material to release the oil into a container or holding bin. (Sinha-OEIS)
W73-11886

METHOD OF REMOVING OIL SPILLS FROM WATER,
Texaco, Inc., New York. (assignee)
F. C. McCoy, H. V. Hess, and R. L. Sung.
U.S. Patent No 3,732,162, 3 p, 1 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 622, May 8, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Asphalt, *Coagulation, *Pollution abatement, *Water quality control, *Water pollution control.
Identifiers: Petroleum wax.

A coagulant such as asphalt having a melting point above about 250F, and mixtures of asphalt and petroleum waxes with hydrophilic anticaking agents are used to absorb oil floating on water. The coagulant may be sprayed while in the molten state onto the oil spill where it will solidify and flux with the oil. The resulting semi-solid mass which has a lesser density than water will float until removed. (Sinha-OEIS)
W73-11891

FLOATING DEBRIS RECOVERY APPARATUS,
R. R. Tipton.
U.S. Patent No 3,731,813, 4 p, 12 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 2, p 538, May 8, 1973.

Descriptors: *Patents, Flotsam, *Oil spills, *Oil pollution, Skimming, Equipment, *Pollution abatement, *Water quality control, *Water pollution control.

A marine vessel is equipped with a holding basin into which flotsam or oil is moved by a rotating skimmer with a floating wier along the edge of the basin used to separate the floating liquid debris from the surface of the water and allow it to flow into a collection tank. A conveyor is used to remove the solid debris from the holding basin. (Sinha-OEIS)
W73-11893

LIQUID FILTERING APPARATUS,
For primary bibliographic entry see Field 05D.
W73-11898

DEPARTMENT OF ENVIRONMENTAL QUALITY; EXECUTIVE COMMITTEE.
For primary bibliographic entry see Field 06E.
W73-11964

WATER RIGHT CHANGES TO IMPLEMENT WATER MANAGEMENT TECHNOLOGY,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 06E.
W73-11969

PROCEDURAL REGULATIONS OF THE NEW ALABAMA WATER IMPROVEMENT COMMISSION,
Union Bank and Trust Co., Montgomery, Ala.
For primary bibliographic entry see Field 06E.
W73-11970

KANSAS-NEBRASKA BIG BLUE RIVER COMPACT.
For primary bibliographic entry see Field 06E.
W73-11972

MARINE SANCTUARIES IN CALIFORNIA.
For primary bibliographic entry see Field 06E.
W73-11973

POLLUTION CONTROL UNDER THE PENNSYLVANIA CLEAN STREAMS LAW,
For primary bibliographic entry see Field 06E.
W73-11976

AN ACT RELATING TO IRRIGATION AND WATER CONSERVATION.
For primary bibliographic entry see Field 06E.
W73-11980

LITTLE CALUMET RIVER BASIN COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11983

GREAT LAKES RIVER BASINS COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11984

ENVIRONMENTAL HEALTH (CONSTRUCTION SITE REGULATIONS).
For primary bibliographic entry see Field 06E.
W73-11985

ENVIRONMENTAL MANAGEMENT.
For primary bibliographic entry see Field 06E.
W73-11986

UPPER MISSISSIPPI RIVERWAY COMPACT.
For primary bibliographic entry see Field 06E.
W73-11989

WATER QUALITY COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11991

MILLDAMS AND RACES.
For primary bibliographic entry see Field 06E.
W73-11992

SOIL CONSERVATION.
For primary bibliographic entry see Field 06E.
W73-12002

WATER AND AIR POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W73-12003

THE PROBLEM OF PHOSPHORUS IN NEW YORK'S WATERS.
New York State Dept. of Environmental Conservation, Albany.

February 1973. 23 p, 28 ref.

Descriptors: *Phosphates, *Water pollution sources, *Eutrophication, *Detergents, *New York, Legislation, Water pollution, Municipal wastes, Sewage treatment, Waste water treatment, Nutrients, Nutrient removal, Reviews.

A major cause of accelerated eutrophication of lakes in New York State is the enrichment of lake water with phosphorus from detergents. Studies have shown household detergents to be the source of about half of the phosphorus content in municipal waste water discharges. Recognizing this problem, the New York State Legislature adopted laws to limit the phosphate content of household cleaning products to 8.7 percent by January 1, 1972 and to trace levels by June 1, 1973. It is also the policy of the State to reduce phosphorus in waste water discharges through the use of tertiary sewage treatment, because this will remove the phosphates contributed by detergents and other sources as well. However, implementation of tertiary treatment will take a minimum of ten years, and many lake communities do not have sewers or central treatment plants. The banning of phosphates causes problems, however. Flame-retardent fabric often loses its ability to remain fire-resistant when washed in low phosphate or no-phosphate detergent. Further research into other methods of fire proofing should eventually result in fire-treatment methods that are not adversely affected by phosphate-free detergents. Dishwasher detergents, which constitute only 3 percent of all phosphate in detergents, are presently ineffective without phosphates. Substitutes for phosphates can also be toxic to humans and need to be studied before put into wide use. Modifications may be needed in New York State law to cope with these difficulties. A survey found that 15 states and 54 cities and counties have taken legislative action to cope with detergent phosphates. (Poertner)
W73-12012

MISSOURI WATER QUALITY STANDARDS SUMMARY.
Missouri Clean Water Commission, Jefferson City.

Available from NTIS, Springfield, Va 22151 as PB-214 087, Price $3.00 printed copy; $1.45 microfiche. Environmental Protection Agency--Missouri Clean Water Commission Publication, May 1972. 39 p, 7 fig.

Descriptors: *Water quality standards, *Missouri, *Water pollution control, *Interstate rivers, *Water Quality Act, Pollution abatement, Water quality control, Regulation, Waste disposal, Industrial wastes, Municipal wastes.

In the Water Quality Act of 1965, Congress authorized the establishment of water quality standards for interstate (including coastal) waters. Water quality standards approved by both the Federal Government and the State of Missouri are presented. The standards consist of three major components: designation of the uses which interstate waters are to serve, specification of narrative and numerical criteria to protect and enhance water quality, and specification of a plan of implementation and enforcement, which includes treatment and control requirements for municipal, industrial and other wastes discharged to or affecting interstate waters. The standards are enforceable under the State water pollution control statutes and the Federal Water Pollution Control Act. (Woodard-USGS)
W73-12034

WATER SUPPLY AND SEWERAGE PLANNING IN CENTRAL MERRIMACK VALLEY REGION: PHASE ONE.
Metcalf and Eddy, Inc., Boston, Mass.

Prepared for Central Merrimack Valley Regional Planning District, September 1970. 32 p, 1 fig, 6 tab, 1 append. HUD Mass. P-67.

Descriptors: *Planning, *Water supply, *Sewerage, Pollution abatement, Massachusetts.
Identifiers: *Merrimack River Basin, Utility systems expansion, Inventories, Lawrence (Mass), Newbury (Mass), West Newbury (Mass), Newburyport (Mass), Andover (Mass), Methuen (Mass), North Andover (Mass).

This very general planning study of water supply and sewerage needs for fifteen cities and towns in the Central Merrimack Valley is oriented toward describing planning situations and strategies rather than specific projects. The three basic parts of the report are (1) a discussion of the use of the streams in the Merrimack basin for both water supply and wastewater disposal; (2) a water supply systems inventory and planning strategy; and (3) a sewerage systems inventory and planning strategy. With regard to water supply the cities tend to fall into three categories: those where the future supply is reaching a critical stage, e.g. Lawrence and Newburyport; those with adequate supplies and possible responsibilities to supply neighboring urban areas; and those that can rely on local

groundwater supplies. In relation to sewerage, four cities are planning a sub-regional treatment plant and interceptor sewer system, four others are under state orders to improve their level of wastewater treatment, and the remaining urban areas have no treatment. (Elfers-North Carolina)
W73-12043

STUDY - WATER AND SEWER FACILITIES - MOBILE COUNTY.
Converse (J. B.) and Co., Inc., Mobile, Ala.
For primary bibliographic entry see Field 05D.
W73-12049

WATER SUPPLY VOLUME OF TECHNICAL APPENDIX FOR REGIONAL UTILITIES STUDY.
Minges (James S.) and Associates, Inc., Farmington, Conn.

Prepared for Capitol Region Planning Agency, Hartford, Connecticut, 1969. 140 p, 9 fig, 6 maps, 27 ref, glossary. UPA-CONN. P-78 (G).

Descriptors: *Water supply, *Water supply development, *Water demand, *Water management (Applied), Planning, Groundwater, Surface Water Availability, Projections, Land use, Connecticut.
Identifiers: Service areas, Hartford (Connecticut), Water compensation requirements.

This appendix contains the detailed background data related to water supply and used to formulate plans and programs presented in the Regional Utilities Study. Basically a working document, it serves to illustrate the planning process involved in the formulation of the final water supply plans for the metropolitan area of Hartford, Connecticut. The data and planning information fall under several categories: (1) background data on population, land use, and planning procedures; (2) water supply inventory data such as existing sources of water, existing supply systems, and water quality analysis; (3) the future demand for water by service areas; (4) alternative water supply plan elements such as groundwater and surface water sources; and (5) program elements for implementation including staging and costs. (Elfers-North Carolina)
W73-12050

OBSERVATION ON THE SIMULATED EFFECTS OF RAIN ON LARVA OF NEODIPRION SWAINEI (HYMENOPTERA, DIPRIONIDAE),
British Columbia Univ., Vancouver. Dept. of Plant Science.
For primary bibliographic entry see Field 02I.
W73-12160

STUDIES OF THE SPRAY ZONE OF CHURCHILL FALLS, LABRADOR,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-12162

ASPECTS OF THE BIOLOGY OF THE LUMBRICIDS EISENIELLA TETRAEDRA (SAVIGNY) AND DENDROBAENA RUBIDA (SAVIGNY) F. SUBRUBICUNDA (EISEN) IN A PERCOLATING FILTER,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05C.
W73-12175

(A BILL TO BE ENTITLED: THE OIL POLLUTION COMPENSATION ACT OF 1973).
For primary bibliographic entry see Field 06E.
W73-12191

THE TECHNOLOGY OF SOLID WASTE MANAGEMENT--IMPLICATIONS FOR STATE POLICY.
California Assembly General Research Committee, Sacramento. Assembly Science and Technology Advisory Council.

Available from National Technical Information Service, U.S. Dep't. of Commerce, as PB-205 240. July 1971. 38 p, 1 fig.

Descriptors: *Solid wastes, *California, *Environmental effects, *Waste treatment, *Waste disposal, Water quality control, Disposal, Reasonable use, Governments, Comprehensive planning, Recycling, Landfills.

This panel on Solid Waste Management was charged with the task of reviewing present technological issues and with identifying constraints and opportunities for improved methods of solid waste disposal in California. The panel clarified the objectives of improved solid waste practices in California and outlined an expanded role for state government in the field of solid waste management. The major contribution is emphasis on the need for a systems approach to solid waste management and an examination of economic and social factors which are of fundamental importance in the application of improved technology. Many of the recommendations set forth general directions for state policy and action. Three major areas of concern in the management of solid waste are environmental degradation resulting from waste disposal and extraction of raw materials, accelerating costs to local government for waste handling and disposal, and resource depletion as non-renewable resources are discarded as waste and lost for future use. (Mockler-Florida)
W73-12193

REGULATION RELATING TO MONITORING AND REPORTING WASTEWATER DISCHARGES AND THEIR EFFECT UPON RECEIVING WATERS.
North Carolina Dept. of Natural and Economic Resources, Raleigh.

1973. 40 P.

Descriptors: *North Carolina, *Waste disposal, *Waste identification, *Water pollution sources, Legislation, Water pollution control, Waste treatment, Environmental sanitation, Regulation, Monitoring, Sewage effluents, Treatment facilities, Waste treatment, Sampling, Influent streams, Effluents, Permits.
Identifiers: *Administrative regulations.

This is a proposed regulation relating to monitoring and reporting of wastewater discharges and their effect upon receiving waters by the North Carolina Board of Waters and Air Resources. The regulation provides that the owner or person in charge of every water pollution control facility which receives a wastewater influent from more than one source shall report to the Department the name of every industrial establishment contributing wastes containing toxic materials. Every person subject to the regulation shall be required to maintain an approved monitoring system. In addition, biological monitoring may be required when necessary to determine whether uses of larger bodies of water are being or will be impaired by discharges sufficient in volume or character, to adversely affect the natural biota of the water involved. Penalties for violation of the regulation are provided and the regulation contains a severability clause. Charts, graphs, and applicable definitions are included. All applications for permits shall be accompanied by a proposal for a complying monitoring and reporting system. (Mockler-Florida)
W73-12194

OZARK INDUSTRIES, INC. V. STUBBS TRANSPORTS, INC. (ACTION TO RECOVER FISH-KILL DAMAGES WHEN GASOLINE FROM OVERTURNED TRUCK FOUND ITS WAY INTO SPRINGFED TROUT POOL).
For primary bibliographic entry see Field 06E.
W73-12197

REPORT ON PUBLIC HEARINGS ON THE ADOPTION OF PROPOSED REGULATIONS FOR THE PURPOSE OF IMPLEMENTING THE WATER AND AIR QUALITY REPORTING ACT OF 1971.
North Carolina Dept. of Natural and Economic Resources, Raleigh.

Board of Water and Air Resources Report, February 1, 1973. 247 p.

Descriptors: *North Carolina, *Legislation, *Monitoring, *Water quality control, *Pollutant identification, Pollution abatement, Water pollution sources, Law enforcement, Air pollution, Water pollution control, Wastes, Waste identification, Waste water (Pollution), Water conservation, Legal aspects.
Identifiers: *North Carolina Water and Air Quality Reporting Act of 1971, Administrative regulations.

The purpose of the hearing was to allow the public an opportunity to express its views on proposed regulations implementing the North Carolina Water and Air Quality Reporting Act of 1971. The Act requires first, the filing of reports with the Board of Water and Air Resources covering the discharge of wastes and air contaminants to the waters and outdoor atmosphere and second, the establishing and maintaining of approved systems for monitoring the quantity and quality of such discharges and their effects upon the air and water resources of the state. Statements were made by interested individuals, corporations, municipalities and governmental agencies. (Reed-Florida)
W73-12198

A BILL TO ASSURE THE PUBLIC IS PROVIDED WITH AN ADEQUATE QUANTITY OF SAFE DRINKING WATER.
For primary bibliographic entry see Field 06E.
W73-12199

AQUATIC PLANT CONTROL AND ERADICATION PROGRAM, STATE OF TEXAS (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W73-12203

DISCHARGE OF UNTREATED WASTES INTO THE MISSISSIPPI RIVER.
For primary bibliographic entry see Field 06E.
W73-12204

SAFE DRINKING WATER.

Supp. Hearings--Subcomm. on Public Health and Environment--Comm. on Interstate and Foreign Commerce, U.S. House of Representatives. 92d Cong, 2d Sess, June 7, 8, 1972. 198 p, 1 chart.

Descriptors: *Legislation, *Water supply, *Public health, *Potable waters, Water sources, Environmental sanitation, Water treatment, Water purification, Domestic water, Water quality, Groundwater resources, Underground waste disposal, Governmental interrelations, Water quality standards.
Identifiers: *Congressional hearings, Administrative regulations.

H.R. 14899 would amend the Public Health Service Act and the Federal Food, Drug, and

Cosmetic Act to assure that the public is provided with safe drinking water. This legislation would provide for the establishment by the federal government of certain standards pertaining to drinking water and its sources as well as federal assistance to state agencies and other authorities for development of improved methods for the treatment and purification of water. A requirement that federal standards be developed for recreational waters was deleted from the proposal. The proposal requires development by states of programs which contain minimum requirements to control underground injection of waste which may result in the contamination of a source of drinking water. Primary responsibility for the development and operation of the program is placed on the state and only if a state fails to develop and enforce its own program will the federal government step in. Currently, few states regulate the quality of underground waters; thus, this bill would plug a potential loophole by regulating underground waste disposal. (Mockler-Florida)
W73-12205

CITIZENS FOR CLEAN AIR, INC. V. CORPS OF ENGINEERS, U.S. ARMY (PUBLIC HEARING NOT REQUIRED UNDER THE NEPA).
For primary bibliographic entry see Field 06E.
W73-12209

CIVIL LIABILITY FOR OIL POLLUTION,
A. Black.
Houston Law Review, Vol 10, No 2, p 394-425, January 1973. 201 ref.

Descriptors: *Oil pollution, *Water Quality Act, *International law, *Oceans, *Treaties, Water quality standards, Legal aspects, Liability, Water pollution sources, Oil wastes, Oil spills, Economics, United Nations, Governmental interrelations, Law of the sea, International commission.
Identifiers: Absolute liability.

Recent efforts to cope with the burgeoning contamination of the world's seas and shores from oil are examined. The historical background of international treaties relating to oil pollution is discussed. Two United Nations treaties dealing with civil liability and recovery for oil pollution damage are analyzed. The treaties are compared with related provisions of the Water Quality Improvement Act of 1970, a recent federal response to the need for environmental protection. Reconcilation of conflicting provisions of the treaties and the federal statute is recommended so that they will operate harmoniously and effectively. The United States should establish a revolving fund composed of the contributions of those who receive oil in order to meet more fairly and efficiently the need for additional compensation for oil pollution damage. It is emphasized that oil pollution of the seas represents an urgent concern of the international community. (Mockler-Florida)
W73-12213

THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972: EFFECTIVE CONTROLS AT LAST,
J. Lipman.
Brooklyn Law Review, Vol 39, No 2, p 403-425, Fall 1972. 187 ref.

Descriptors: *Rivers and Harbors Act, *Permits, *Legislation, *Water pollution control, *Federal Water Pollution Control Act, Legal aspects, Water quality standards, Waste treatment, Water pollution treatment, Water pollution sources, Governmental interrelations, State jurisdiction, Penalties (Legal), Judicial decisions.
Identifiers: *Refuse Act, *Effluent limitations, Citizen suits.

In the fall of 1972, in response to the obvious inadequacies of federal water pollution control laws, the House and the Senate each passed water pollution control bills which amended and expanded the 1899 Refuse Act and the Federal Water Pollution Control Act. The objectives of both the proposed bills and the final legislation are to restore and maintain the chemical, physical, and biological integrity of the Nations's waters. The legislation requires the application of the best practicable water pollution control technology by July 1, 1977, and the best available technology with cost considerations by 1983. This note describes the Refuse Act of 1899, the now defunct Refuse Act Permit Program and compares the 1972 Amendments to the 1899 Act. Special emphasis is placed on comparing the respective permit programs and citizen suits under the two Acts. Although the 1972 law could still be improved, it remedies most of the deficiencies of the old Federal Water Pollution Control Act and the 1899 Refuse Act. One suggested improvement would be placing strong emphasis on tax incentives for installing pollution control devices to help control pollution at the source. (Mockler-Florida)
W73-12214

WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W73-12216

LOUISIANA COASTAL COMMISSION.
For primary bibliographic entry see Field 06E.
W73-12217

SAVE OUR TEN ACRES V. KREGER (STANDARD OF JUDICIAL REVIEW OF AGENCY ACTION UNDER NEPA).
For primary bibliographic entry see Field 06E.
W73-12218

CONSCIOUSNESS OF STREAMS: THE 1971 ALABAMA WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W73-12219

ENVIRONMENTAL POLICY.
For primary bibliographic entry see Field 06E.
W73-12228

POLLUTION OF WATERS OF STATE.
For primary bibliographic entry see Field 06E.
W73-12230

A PROPOSAL FOR A MODEL RIVER PROJECT CONCERNING 'RIVERFRONT BEAUTIFICATION AND UTILIZATION IN METROPOLITAN AREAS.'
Omaha-Council Bluffs Riverfront Development Committee, Nebr.
For primary bibliographic entry see Field 06B.
W73-12235

NATURAL FEATURES IN BURLINGTON COUNTY.
Burlington County Planning Board, Mount Holly, N.J.
For primary bibliographic entry see Field 06G.
W73-12241

MOSQUITOES OF ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 04A.
W73-12243

US-USSR EXPERTISE EXCHANGE,
For primary bibliographic entry see Field 06E.
W73-12255

ENVIRONMENTAL GUIDE FOR THE U.S. GULF COAST,
National Climatic Center, Ashville, N.C.
For primary bibliographic entry see Field 06G.
W73-12310

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SYSTEMS ANALYSIS OF THE GREAT LAKES,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 04A.
W73-11703

DEVELOPMENT OF A STATE WATER--PLANNING MODEL, PART IV, DATA PREPARATION,
Montana State Univ., Bozeman. Water Resources Research Center.
T. Williams, D. Boyd, and R. Brustkern.
Available from the National Technical Information Service as PB-222 011, $3.00 in paper copy, $1.45 in microfiche. Report No 34, January 1973. 192 p, 13 append. OWRR-B-029-MONT (6).

Descriptors: *Water resources planning, *Planning, *Data processing, *Model studies, *Data collections.

Development of the state water planning model has been described in earlier reports (See W71-10641, W72-10435, and W73-05578). The model is a system of mathematical expressions and equations, programmed for solution on a digital computer. To use the model, it is necessary to supply as input, data of various kinds. The earlier reports have distinguished between 'primary' and 'secondary' data. Primary parameters are those for which historical records have been kept and which are available in the literature. Typical are precipitation, reservoir storage and stream discharge. Secondary parameters are those for which no records are presently available, and for which values must be estimated or generated through the model itself. Typical secondary parameters are groundwater discharge, infiltration, and consumptive use. This report describes the data compilation procedures and explains how basin average or 'lumped' values were obtained. It also documents the data which have been stored on the bank (See also W73-11709) (Holje, Montana).
W73-11708

DEVELOPMENT OF A STATE WATER--PLANNING MODEL, PART V, DATA BANK OPERATORS MANUAL,
Montana State Univ., Bozeman. Water Resources Research Center.
D. I. Stanfield, Sr., and W. H. Moore.
Available from the National Technical Information Service as PB-222 012, $3.00 in paper copy, $1.45 in microfiche. Report No 35, Jan. 1973. 87 p, 6 append. OWRR B-029-MONT (7).

Descriptors: *Water resources planning, *Model studies, *Data collections, *Computers, Montana, Computer programs.

The water resources data-bank was developed for the Water Resources Division of the Department of Natural Resources, Helena, Montana, in cooperation with the Department of Civil Engineering, Montana State University, Bozeman. Complete details are provided of the data bank as it now exists. All pertinent information is set forth including actual data resident in the bank,

completed programming specifications for data not yet available, a complete set of all associated programs written for the system, all data formats, and a discussion of the random access feature and keying formats. Also included is a special section dedicated to those system features implemented only on the XEROX SIGMA 7 machine and not on the IBM 360/40. A detailed analysis is presented of the DATA-BANK UPDATE program from a programming point of view. This will enable system analysts to make further additions to the system without in-depth referrals to the originating source. (See also W73-11708) (Holje, Montana).
W73-11709

MANAGEMENT SCIENCE, ECONOMICS AND ENVIRONMENTAL SCIENCE,
Resources for the Future, Inc., Washington, D.C.
A. V. Kneese.
Management Science, Journal of the Institute of Management Sciences, Vol 19, No 10, p 1122-1137, June 1973. 1 fig, 18 ref.

Descriptors: *Management, *Economics, *Environment, *Political aspects, *Ecology, Atmosphere, Optimization, Mathematical models, Water resources, Regions, Simulation analysis, Governments, Constraints, Cost-benefit analysis, Pollution abatement, Linear programming.
Identifiers: *Russel-Spofford model, *Residuals management, *Microeconomics, *Environmental quality.

Microeconomics and management science are closely related in terms of the tools they employ; both treat as a central question the matter of how one optimizes for an objective, in a static or a dynamic setting, given constraints upon the resources available to achieve it. Economics differs primarily in that it studies the performance of entire economic systems and major subsystems. Management science models can be expanded to examine environmental policy and the design of institutions for environmental management. This is illustrated by a quantitative model which incorporates as submodels natural atmospheric and ecological systems and the political structure of alternative forms of representative government. This model, the Russel-Spofford regional residuals management model, utilizes linear programming; furthermore, its components include environmental models (physical, chemical, and biological) which describe the fate of various residuals after their discharge into the natural environmental systems, and a set of receptor-damage functions relating the concentration of residuals in the environment and the impact on living things to the resulting damages. Evaluation and the objective function, theory of collective choice, and politicizing the Russel-Spofford model are discussed. (Bell-Cornell)
W73-11867

IMPLICATIONS OF A SYSTEMS APPROACH TO OCEANOGRAPHY,
Washington Univ., Seattle. Dept. of Oceanography.
J. J. Walsh.
Science, Vol 176, No 4038, p 969-975, June 2, 1972. 3 fig, 1 tab, 79 ref.

Descriptors: *Oceanography, *Biomes, *Systems analysis, Computers, Model studies, Simulation analysis, Marine plants, Marine biology, Marine fish, Marine animals, Data collections.
Identifiers: *Marine ecosystems, *Marine biomes.

A detailed survey of the use of systems analysis for modeling marine ecosystems is presented. Contemporary data acquisition and computer systems on ships enable oceanographers to examine data on a large number of variables while at sea. This ability to rapidly examine the changing parameters of a marine ecosystem, through either continuous monitoring or cooperative experiments aboard ship, has led oceanographers to consider undertaking holistic studies of marine exosystems. Sufficient data on the distribution of system variables can be processed fast enough for individual oceanographers to interact at sea rather than years later, to plan group experiments while in the study area, and to begin to use simulation models as tools for the synthesis of incoming data. (Bell-Cornell)
W73-11868

POPULATION AND POLLUTION IN THE UNITED STATES,
Resources for the Future, Inc., Washington, D.C.
R. G. Ridker.
Science, Vol 176, No 4039, p 1085-1090, June 9, 1973. 3 ref.

Descriptors: *Pollution abatement, *Population, *Wastes, *Model studies, *Environment, Water quality, Economics, Technology, Institutions, Systems analysis.

Man-made pollution arises as a consequence of flows of materials such as metals, fuels, and foodstuffs through the economy. Presented is a model describing the principal links between environmental pollution on the one side and population and per capita incomes on the other. Pollution is measured in points emitted per year. The proportion of unrecyclable wastes to the level of economic activity is considered, as well as damages caused by the concentration of pollution. Three kinds of damages are: (1) harm to economically valuable goods and services, such as fish killed by DDT; (2) human mortality; and (3) a wide variety of losses resulting from physical changes in the environment. Considered next are the major factors that could cause significant changes in these parameters. Discussed are: Changes in the geographic distribution of population, in the amount and composition of consumption, and in technology and institutions. It is concluded that no single cause is sufficient to explain this country's environmental problems. A slowdown in the rate of population growth is advocated to give the American people more time, time to allow for massive changes in attitudes and behavior patterns necessary for improving the quality of the environment. (Bell-Cornell)
W73-11869

DETERMINING THE BEST SIZES OF THE OPEN CUT CANALS USED IN HYDROAMELIORATIONS,
U. Berar, V. Ionescu, and D. Somnea.
Economic Computation and Economic Cybernetics Studies and Research, No 4, p 99-106, 1972. 3 fig, 2 tab, 7 ref.

Descriptors: *Canals, *Dimensions, *Hydraulics, Optimization, Estimating, Equations, Mathematical models, Irrigation water, Excess water (Soils), Water flow, Size, Systems analysis.
Identifiers: *Open cut canals, *Hydroameliorations, Froude's number, Water depth.

The dimensioning of open cut canals used for bringing irrigation water or for evacuating excess waters in the case of draining systems is a constant consideration on the part of many researchers because of the laborious necessary computing method. Many methods (envisaging graphs, tables, slide rules, etc.,) exist for the dimensioning of these structures, but generally they are difficult to use. A mathematical model is proposed which should solve the problem of the dimensioning of the irrigation canals in a number of cases. Results are presented in the form of tables. (Bell-Cornell)
W73-11870

BENEFITTED WATER DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11988

A MASTER PLANNING METHODOLOGY FOR URBAN DRAINAGE,
Rice (Leonard) Consulting Water Engineers, Denver, Colo.
For primary bibliographic entry see Field 04A.
W73-12006

A WATER AND SEWER PLAN: CLARKE COUNTY, GEORGIA.
Mayes, Sudderth and Etheredge, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 05D.
W73-12013

A WATER AND SEWER PLAN: BARROW COUNTY, GEORGIA.
Mayes, Sudderth and Etheredge, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 05D.
W73-12014

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME I: GOALS, OBJECTIVES, AND STANDARDS FOR WATERWORKS, SANITARY SEWERAGE, SOLID WASTE MANAGEMENT, STORM DRAINAGE AND FLOOD PLAIN MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 05D.
W73-12016

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME III: AREA-WIDE SOLID WASTE MANAGEMENT,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 05E.
W73-12018

SUMMARY REPORT ON THE UPPER BEAR CREEK EXPERIMENTAL PROJECT.
Tennessee Valley Authority, Knoxville. Div. of Water Control Planning.
For primary bibliographic entry see Field 02A.
W73-12026

NATURAL RESOURCE INFORMATION SYSTEM, VOLUMES I AND II.
Boeing Computer Services, Inc., Seattle, Wash.

Available from NTIS, Springfield, Va 22151 Vol. 1 p PB-211-381 Vol II as PB-211 382 Price $3.00 printed copy each; $1.45 microfiche, each. April 28, 1972. 102 p, 20 fig, 10 tab, 10 ref. NASA Task No. 160-75-04-12-10.

Descriptors: *Land management, *Remote sensing, *Aerial photography, *Data processing, Computer programs, Systems analysis, Input-output analysis, Information retrieval, Planning, Watershed management, Satellites (Artificial).
Identifiers: *Natural resources data processing.

The Bureau of Indian Affairs (BIA) and the Bureau of Land Management (BLM) are managing approximately 20% of the United States land area, some 475 million acres. Recognizing the need for development of a computer based information system which would handle remote sensing as well as conventional mapping data, BIA and BLM contracted with Boeing Computer Services for the design and construction of a prototype natural resources information system. The primary objective was the design of a computer based system which would store, process, and display data of maximum usefulness to land management decision making. The system was to include graphic input and display, and the use of remote sensing as a data source; it was to be useful at multiple management levels. The report is presented in two volumes. Volume I summarizes program activities and provides a brief description of the Natural Resources Information System. Volume II pro-

vides computer system operating procedures and instructions. (WoodardoUSGS)
W73-12040

WATER RESOURCES DATA IN ALABAMA,
Auburn Univ., Alabama. Dept. of Civil Engineering.
C. H. Harrison.
Available from NTIS, Springfield, Va. 22151 as PB-213 850 Price $3.00 printed copy; $1.45 microfich. Contract Report for Alabama Development Office, February 1972. 88 p, 1 fig, 8 tab, 74 ref. WRP 71-1.

Descriptors: *Data collections, *Alabama, *Data processing, *Hydrologic data, Computers, Planning, Water resources development, State governments.

Needs for water resources data in Alabama are compared with available data sources. The greatest deficiency is in the area of surface water quality data. Very little of the water pollution control and management data requested by the Federal Environmental Protection Agency are available in Alabama. The principle recommendations for data management are: increased utilization of computer services now offered by the U.S. Geological Survey, collection of more streamflow and water quality data during periods of low flow, employment of three programmer-engineers to aid in water resources planning and management, and consideration of the needs of the Department of Conservation in the collection of water resources data. A central computerized water resources data bank for Alabama is not recommended. (Knapp-USGS)
W73-12074

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. I.
For primary bibliographic entry see Field 04A.
W73-12269

ENVIRONMENTAL CONTROL SYSTEMS: TREATMENT OF UNCERTAINTY IN MODELS AND DATA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
S. F. Moore, and J. W. Brewer.
In: Proceedings (Vol I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 16-30, (1972) 3 fig, 4 tab, 21 ref.

Descriptors: *Environmental control, *Methodology, *Mathematical models, Water resources, Decision making, Monitoring, Design, Probability, Distribution, Filters, Volcanoes, Systems analysis, *Risks.
Identifiers: *Environmental systems, *Bayesian design methods, Kalman-Bucy filtering techniques, Rare occurrences theory.

In order to achieve effective environmental control, it is necessary to develop methodologies for dealing with uncertainty. A rational design method allows engineers to find the best solution, given all the available (but uncertain) information. A mathematical model is interpreted as a formalism for expressing uncertainty and implementing Bayesian design methods. The nature of uncertainty in models and data of environmental systems is examined, and a framework for dealing with uncertainty in environmental systems is established; in particular, concepts of Bayesian design and estimation theory are reviewed and redefined relative to environmental systems. The general theory is translated into a useful tool for coping with uncertainty in environmental systems using Kalman-Bucy type filtering techniques. Applications and examples include design of monitoring systems, adaptive decision making for control model identification and parameter estimations. The theory of rare occurrences is applied to volcanic eruptions to illustrate the importance of rare occurrence distributions in environmental systems. Conclusions include: 1) Uncertainty in environmental systems can be treated quantitatively and effectively; 2) Bayesian design is a rational approach, providing the necessary theoretical framework; and 3) the general theory can be translated into effective problem solving tools having application in design and management. (See also W73-12269) (Bell-Cornell)
W73-12271

EVALUATION OF SEASONAL TIME-SERIES MODELS: APPLICATIONS TO MID-WEST RIVER FLOW DATA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-12272

TECHNOLOGICAL UNCERTAINTY IN THE ECONOMIC EVALUATION OF NEW WATER RESOURCES,
Hawaii Univ., Honolulu. Coll. of Business Administration.
N. A. El-Ramly.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resources Systems, University of Arizona, Tucson, December 11-14, 1972. p 48-63, (1972). 1 fig, 6 ref.

Descriptors: Technology, *Water resources, *Economics, *Evaluation, Performance, Costs, *Decision making, Analytical techniques, Alternative planning, Mathemtaical models, Systems analysis, *Risks.
Identifiers: New systems, Confidence levels, Subjectivity (Judgment).

Presently, the accumulated operational data about new water resources (i.e., water reuse, desalting, cloud seeding) are inadequate for objective estimation of the probability distributions of their performance characteristics. Presented is a conceptual framework for taking into account, in economic evaluations, the varying degrees of confidence professed in prospective technological possibilities. To show how technological uncertainties may be evaluated, an investment concept--uncertainty cost of new systems--is introduced and analyzed. The subjectivity of uncertainty is discussed, and a conceptual representation of the effect of information upon confidence level is developed. A simple analytical model describing the decision problem of choice between two alternatives with different levels of confidence in achieving anticipated performances is suggested. This model can be used to arrive at decisions in specific cases provided that the uncertainty cost can be estimated. Finally, the conceptual framework is applied to interpret some general trends, and to provide objective explanations for decisions in specific cases. Although attention is focused on explaining the manner in which the proposed methods of analysis can be used in the economic evaluation of new water resources, nevertheless the conceptual framework is equally valid to any situation where competing systems with different degrees of uncertainty are involved. (See also W73-12269) (Bell-Cornell)
W73-12273

ANALYSIS OF STREAMFLOW FORECASTING UNCERTAINTY,
California State Univ., Sacramento.
For primary bibliographic entry see Field 04A.
W73-12277

RELIABILITY AND UNCERTAINTY IN PREDICTING TRANSPORT PROCESSES IN NATURAL STREAMS AND RIVERS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-12279

HYDROLOGIC FORECASTING WITH SEQUENTIAL DETERMINISTIC AND STOCHASTIC STAGES,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04A.
W73-12280

A PLAN FOR THE CONSTRUCTION AND TESTING OF WATER POLLUTION FORECASTING MODELS,
Missouri Univ., Columbia. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05B.
W73-12281

UNCERTAINTIES IN ESTIMATING RUNOFF--PRODUCING RAINFALL FOR THUNDERSTORM RAINFALL-RUNOFF MODELS,
Agricultural Research Service, Tucson, Arizona. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02A.
W73-12282

REDUCTION OF UNCERTAINTIES IN AUTOCORRELATION BY THE USE OF PHYSICAL MODELS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W73-12283

STREAMFLOW FREQUENCY USING STOCHASTICALLY GENERATED HOURLY RAINFALL,
CH2M/Hill, Bellveue, Wash.
For primary bibliographic entry see Field 02E.
W73-12284

TESTS OF STATIONARITY OF HYDROLOGIC TIME SERIES,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02A.
W73-12286

STOCHASTIC MODELS FOR PRECIPITATION,
Metropolitan State Coll., Denver, Colo. Dept. of Mathematics.
For primary bibliographic entry see Field 02B.
W73-12287

INFORMATION TRANSFER VIA REGRESSION IN MARKOVIAN WORLDS,
IBM Watson Research Center, Yorktown Heights, N.Y.
J. R. Wallis, and N. C. Matalas.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 410-447, (1972). 2 fig, 18 tab, 11 ref.

Descriptors: Hydrology, *Monte Carlo methods, *Stochastic processes, Water demand, Hydrologic data, Networks, Analytical techniques, Probability, Decision making, *Risks.
Identifiers: *Information transfer, *Data programs.

The uncertainity in the transferrability of information via regression is examined. Monte Carlo experiments used to assess the risks inherent in deciding whether or not estimates of correlation

coefficients exceed critical values for information transfer are discussed. By Monte Carlo technique, it is found that the information content of the mean is rather insensitive to values of the serial correlation coefficient experienced in hydrology. Similarly with respect to the variance, the information content is more sensitive to serial correlation, particularly for positive values. The use of sample estimates of serial and cross correlation introduces uncertainity as to whether or not information is transferrable between sites. In terms of the prior distribution for the population values of serial and cross correlation, the probability of making the correct decision regarding the transfer of information on the bases of the sample estimates of serial and cross correlation has been defined over the complete sample space. This probability apparently is not extremely sensitive to the assumed prior distributions nor to the length of sequence. Sensitivity increases as the values on which the priors are concentrated approach the decision for the transfer of information as defined by the population serial and cross correlations. (See also W73-12269) (Bell-Cornell)
W73-12294

6B. Evaluation Process

A CASE STUDY IN INTERSTATE RESOURCE MANAGEMENT: THE CALIFORNIA-NEVADA WATER CONTROVERSY, 1865-1955,
California Univ., Davis. Dept. of History.
W. T. Jackson, and D. J. Pisani.
Available from the National Technical Information Service as PB-222 028, $4.50 in paper copy, $1.45 in microfiche. Water Resources Center, University of California Davis, Contribution No 142, May 1973. 51 p. OWRR A-046-CAL (1). UCAL-WRC-W-380.

Descriptors: *Interstate, *Water allocation (Policy), *Lake Tahoe, *History, California, Nevada, Competing uses.
Identifiers: California-Nevada Interstate Water Conference.

A historical summary and evaluation are presented of the controversy between Northern California and Nevada over capture, storage, and distribution of the water supply originating in the Sierra Nevada mountains between the two states. The water controversy is described from the perspective of formal interstate efforts to satisfy those interests and find an equitable way of dividing 'surplus' water between the two states. The majority of the report is concerned with interstate efforts to resolve differences over water allocation, uses, and management from 1931 to 1955. Although significant, the California-Nevada Interstate Water Conference played a relatively ineffective role during this period.
W73-11705

AN INTERACTIVE ANALYSIS OF NATURAL RESOURCE ALLOCATION IN A CONTEMPORARY ESTUARINE ECOSYSTEM,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
A. L. Sullivan.
Available from the National Technical Information Service as PB-222 003, $3.00 in paper copy, $1.45 in microfiche. Technical Report 66, May 1973. 18 p, 1 fig, 6 ref. OWRR-A-023-NY (1). 14-01-0001-1852 and 3032.

Descriptors: *Ecosystems, *Estuarine environment, *Long term planning, *Planning, *Resource allocation, *Water values, Beaches, Boating, Coastal marshes, Dredging, Estuarine fisheries, Fishing, Land development, Landfills, Marine fisheries, Model studies, Resource mix, Shellfish, Water pollution effects, Water resources.
Identifiers: Long Island (New York).

Using the bicounty Nassau-Suffolk region of Long Island as a case study, it was found that the natural resources and resource-use processes of the estuarine zone could be conceptually related in a 'system'. This ecosystem and its interrelationships were specifically displayed in a matrix form so that planning analysis for management decisions could be accomplished. Visually, the twenty-one important processes occurring in the physical, biological, resource-use (market) and socio-economic sectors of the system have been related. The effect of an increase in any one process on all of the others has been indicated in a directional sense as causing an increase, decrease, no effect or countervailing effect. The implication of these effects for planning future activities has been discussed. Emphasized in this study are: fish and shellfish, sand and gravel, waterfront land for housing and commercial development, dredging, erosion, recreational activities including boating, fishing, and swimming, park development, pesticide application and waste discharge. In addition to indicating the probable consequences on all other processes of planning decisions to increase a certain activity, the matrix also provides information about causes. If a result (e.g., loss of aesthetic quality in the estuarine zone) is deemed undesirable, citizen decision makers can be shown graphically those activities or processes causing the undesirable situation.
W73-11710

A PRECIPITATION-BASED FORECAST OF GREAT STORM FLOODS ON MOUNTAIN TRIBUTARIES OF THE DNIESTER (PROGNOZ VYSOKIKH DOZHDEVYKH PAVODKOV GORNYKH PRITOKOV DNESTRA PO OSADKAM),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
I. G. Rubtsov.
In: Formirovaniye i raschety elementov rezhima rek; Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 119, p 40-63, Moscow, 1972. 6 fig, 24 ref.

Descriptors: *Flood forecasting, *Precipitation (Atmospheric), *Storms, *Storm runoff, *Rainfall-runoff relationships, Surface runoff, Overland flow, Discharge (Water), Peak discharge, Water yield, Water loss, Water levels, Subsurface flow, Antecedent moisture content, Moisture availability, Small watersheds, Tributaries, Mountains, Equations.
Identifiers: *Ukraine, *Dniester River, Travel time, Nomograms.

Conditions of formation of outstanding storm floods are analyzed for 4 right-bank tributaries of the Dniester River (Bystritsa, Lomnitsa, Svicha, and Stryy), and a method is proposed for calculating channel inflow from storms and for forecasting maximum flood levels. The depth of storm floods is determined mainly by antecedent moisture conditions of the basin and by amount and intensity of precipitation. Catastrophic storm floods result whenever sufficiently intense rains (10 or 20 mm/hr or greater) occur on a water-saturated ground surface for a 4-6 hr period or more. Moisture conditions of a basin are considered to be critical whenever the basin moisture index is 200 mm or more or the coefficient of relative moisture availability is not less than one. Peak flow on mountain streams of the Dniester basin is derived mainly from high rates of surface runoff. Average values of surface and subsurface flow are 67 mm and 57 mm, respectively, which are 54% and 46% of the entire flood volume. The maximum daily subsurface flow is about 40 mm. An average of about 30% of the total volume of subsurface flow reaches the channel during the first days of the storm period. (See also W73-11825) (Josefson-USGS)
W73-11829

REPORT OF HYDROELECTRIC SUBPROJECT,
Idaho Univ., Moscow. Dept. of Electrical Engineering.
P. Mann.
Available from the National Technical Information Service as PB-222 059, $3.00 in paper copy, $1.45 in microfiche. University of Idaho, Moscow, Water Resources Research Institute, Scenic Rivers Study, Report No 6, 1973, 60 p, 2 fig, 23 tab. OWRR B-014-IDA (15). 14-31-001-3074.

Descriptors: *Hydroelectric power, *Benefits, Idaho, *Water resources development, Alternative water use, Pacific Northwest U.S.
Identifiers: Salmon River (Idaho).

The Salmon River is considered as a single-purpose hydroelectric energy resource from its mouth to North Fork, Idaho, (the 'Study River' portion of the river). This stretch is supported by one storage project on the upper river to represent upriver development in general. Total obtainable storage from the 7 project complex is more than adequate to regulate an average year flow to a winter power peaking pattern judged to be compatible with a mature Pacific Northwest hydrothermal system. The peaking capacity of the ultimate system approaches 8,000,000 kilowatts and average power output is 1,552,000 kw. The system is considered to be developed in three stages over a 30 year time span. Net cumulative benefits over the first 50 years of operation total 3.7 to 5 billion dollars. Annual benefits exceed $100,000,000 per year from the completed system and are expected to continue for the second 50 years of the project life. Net equivalent fossil fuel resource saving over the first 50 year term exceeds 300,000,000 tons of coal and over the 100 year term would constitute 1/2500 of the total estimated mineable U.S. coal reserves.
W73-11888

SURVEYS REQUIRED TO DESIGN NON-STRUCTURAL MEASURES,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 06F.
W73-12005

BALANCING ENVIRONMENTAL AND DEVELOPMENTAL VALUES,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06F.
W73-12008

WATER AND SEWER FACILITY PLAN FOR ADAMS COUNTY, COLORADO.
Oblinger-Smith Corp., Denver, Colo.

Prepared for the Colorado Division of Planning, 1972. 51 p, 14 tab, 11 maps.

Descriptors: *Planning, *Water supply, *Sewerage, Natural resources, Projections, Rural areas, Colorado.
Identifiers: *Adams County (Colorado), Small utility systems.

This general planning study is intended as a comprehensive plan for development of municipal or public water and sewer systems to satisfy both present and future needs. Urban areas of the County near Denver are not included. The study focuses on the small towns of Bennett and Strasburg and recommends the development of additional wells, the extension of the water distribution systems, improved water and wastewater treatment, and the extension of sewer mains. Background information is presented on the county as a whole. This includes natural resources, especially soils, economic and population analyses, land use projections, community facility inventories, and several maps of the county. (Elfers-North Carolina)
W73-12044

NATIONAL LAND USE POLICY: OBJECTIVES, COMPONENTS, IMPLEMENTATION.
For primary bibliographic entry see Field 06E.
W73-12048

WATER POLICIES FOR THE FUTURE.
National Water Commission, Arlington, Va.

Available from GPO, Washington, DC 20402, Price $9.30. Final Report to the President and to the Congress of the United States, Washington, DC, June 1973. 579 p, 8 fig, 51 tab, 4 append.

Descriptors: *Planning, *Water resources development, *Water policy, *National Water Commission, Federal government, Legislation, Social aspects, Water management (Applied).

The National Water Commission's conclusions and recommendations are presented on the policies which it believes the Nation should adopt. The adequacy of basic data to support evaluation, planning, and decisionmaking in water resources varies considerably. It is strongest with respect to the quantitative aspects. The areas of greatest need are in the water quality, environmental, socioeconomic, and water-use aspects, including improvement in the program of reporting flood damages. The presently diversified water resource research effort (i.e., mission agency research and grant agency research) has generally served the Nation well. To assure continued success, steps should be taken to develop a closer tie between planning and research in order to reinforce the value and relevance of each. If the Nation is to aggressively explore the research and development of new technologies in water resources and related fields, it is important that an agency or office charged with this mission be established. (Knapp-USGS)
W73-12052

WATER PUBLICATIONS OF STATE AGENCIES. A BIBLIOGRAPHY OF PUBLICATION ON WATER RESOURCES AND THEIR MANAGEMENT PUBLISHED BY THE STATES OF THE USA.
For primary bibliographic entry see Field 10C.
W73-12161

A PROPOSAL FOR A MODEL RIVER PROJECT CONCERNING 'RIVERFRONT BEAUTIFICATION AND UTILIZATION IN METROPOLITAN AREAS.'
Omaha-Council Bluffs Riverfront Development Committee, Nebr.

May 20, 1971. 16 p, 14 fig, 3 append.

Descriptors: *Planning, *Recreation, Scenic highways, *Parks, Environmental effects, *Nebraska, *Missouri River.
Identifiers: *Riverfront beautification, Omaha (Neb), Council Bluffs (Neb).

American cities have generally neglected the potential beauty of their rivers. A four point program is presented to beautify and redevelop the riverfront area along the Missouri River in Omaha and Council Bluffs. The program calls for two 54 mile scenic, riverside parkways one one each side of the river; the development of a linear park encompassing the parkways and including water-oriented facilities and trails; the careful planning of future development near the river area such as new towns, office parks, and entertainment facilities; and a comprehensive effort to control pollution, conserve wildlife habitat, and generally improve the natural environment. Implementation of the program is envisioned via a pilot project or 'model river' approach. Federal, state, and local agencies are expected to be involved with the Corps of Engineers being the main coordinating agency. (Elfers-North Carolina)
W73-12235

SEWER AND WATER UTILITY REPORT,
Auburn Planning Board, Maine.
For primary bibliographic entry see Field 05D.
W73-12236

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. I.
For primary bibliographic entry see Field 04A.
W73-12269

WATER FOR ALABAMA--IDENTIFICATION OF OBJECTIVES,
Geological Survey of Alabama, University.
H. C. Barksdale.
Available from NTIS, Springfield, Va 22151 as PB-213 715 Price $3.00 printed copy; $1.45 microfiche. Administrative report, December 1969 (revised May 1970). 57 p.

Descriptors: *Water resources development, *Alabama, *Groundwater, *Surface waters, Management, Watershed management, Data collections, Hydrologic data, Project planning, Economics, Water supply, Water demand, Water quality control, Sediment control, Flood control, Urban hydrology, Hydrogeology, Streamflow.

The fundamental and the major subsidiary objectives of the current water-resources planning activity in Alabama are presented. The fundamental objective--to assure the development of the water resources of the state in the interest of all its people--is obvious and requires little elaboration. The subsidiary objectives are necessary steps toward the achievement of the fundamental objective. Each of them is discussed at some length to clearly present its scope and intent. The most pressing need for water-resources knowledge is for data on water use. Other additional knowledge needed is largely in the form of pointed additions to the existing backlog of hydrologic and economic data. The more important of these are: quantitative knowledge of the interrelations between groundwater and surface water in areas where problems may be developing as in the Huntsville and Mobile areas; quantitative knowledge of the potential yield of groundwater sources; and an expansion and intensification of the systems for collecting the time-resource data needed for management decisions. (Woodard-USGS)
W73-12315

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AN APPROACH TO UNDERGROUND CONSTRUCTION,
D'Appolonia (E.) Consulting Engineers, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 08A.
W73-11744

REPORT OF HYDROELECTRIC SUBPROJECT,
Idaho Univ., Moscow. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 06B.
W73-11888

BENEFITED WATER DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11988

WATER SUPPLY VOLUME OF TECHNICAL APPENDIX FOR REGIONAL UTILITIES STUDY.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 05G.
W73-12050

6D. Water Demand

WITHDRAWAL OF WATER BY INDUSTRY IN ILLINOIS, 1970-1971,
Illinois State Water Survey, Urbana.
D. H. Schnepper, J. C. Neill, and R. L. Evans.
Circular 115, 1973. 17 p, 5 fig, 7 tab, 6 ref.

Descriptors: *Withdrawal, *Illinois, *Industrial water, Water utilization, Water reuse, Reclaimed water, Cooling water, Industrial plants.

During 1970-71 in Illinois, 11,020 million gallons per day of water was withdrawn by industry. Surface waters supplied 10,709 mgd; groundwater sources provided 311 mgd. The largest withdrawal, 80% of the total, was by steam electric powerplants and the second largest withdrawal was by the primary metals industry. As the result of reuse and conservation, water withdrawal by industry in Illinois has remained fairly stable during the past decade, despite increases in productivity. (Knapp-USGS)
W73-11813

CRAYFISH FARMING IN THE UNITED STATES,
Louisiana State Univ., Baton Rouge. Fisheries Div.
J. W. Avault, Jr.
Available from NTIS, Springfield, Va 22151 as COM-73 10278, Price $3.00 printed copy; $1.45 microfiche. Louisiana State University Center for Wetland Resources Publication, 1972. 22 p, 11 ref. (Paper presented at the Ist International Symposium on Freshwater Crayfish, September 12-15, 1972,Austria). NOAA-2-35231.

Descriptors: *Crayfish, *Rice, *Louisiana, *Fish farming, Farm ponds, Fish harvest, Rotations, Productivity.
Identifiers: *Crayfish farming.

Most of the U.S. crayfish industry is limited to Louisiana, and until a few years ago, was found almost exclusively in south Louisiana. Even with this limitation well over 10 million pounds, valued at some $5 million, is harvested annually, and close to 35 crayfish processing plants have been licensed by the Louisiana Board of Health. Crayfish farming began over 25 years ago. Crayfish are currently being farmed in three types of ponds: rice-field ponds, wooded ponds, and open ponds. In rice-field ponds crayfish are rotated with the rice. The general procedure followed by the rice farmers is to remove water from the rice field about two weeks before harvesting. This permits drying of the field to facilitate harvest. When drying begins, crayfish burrow. The second growth of rice and grasses, along with rice straw, provides food for the crayfish. Open ponds are often constructed solely for crayfish farming. In July the ponds are drained, mainly as a means of predator control since racoons and wading birds may make serious inroads on the crayfish. In September or October, the ponds are flooded to release them. Crayfish cultured in ponds are harvested in the same manner as in the wild. Both lift nets and funnel traps of chickenwire are used. Ponds with good production yield from 200 pounds to as high as 800 pounds of crayfish per acre. The price generally averages 25 cents a pound. The future of the crayfish industry looks promising and ponds devoted to crayfish farming are increasing. (Knapp-USGS)
W73-11848

INVENTORY AND ANALYSIS OF EXISTING WATER AND SEWER SYSTEMS AND LONG RANGE WATER AND SEWER PLANS, NATCHEZ, MISSISSIPPI,
Jordan, Kaiser and Sessions, Natchez, Miss.
A. R. Winter.
Available from the National Technical Information Service as PB-212 390, $4.25 paper copy, $0.95 in microfiche. Jordan, Kaiser and Sessions,

Consulting Civil Engineers, Natchez, Mississippi, May 1972. 25 p, 13 fig.

Descriptors: *Data collections, *Water works, *Water supply development, *Sewers, Sewerage, Urban drainage, Planning, Water supply, Sewage treatment, Sewage disposal, Mississippi, Water resources, Water distribution (Applied), Water demand, Water pollution, Water pollution control.
Identifiers: *Natchez (Miss).

An inventory and analysis of present water and sewerage systems was made for the Natchez, Mississippi Metropolitan Area and, based on this information, improvements are suggested. Although the Natchez area has an abundant quantity of water in surface and underground sources, shallow underground sources are contaminated by a high iron content and salt discharges from oil wells. The water is very hard, chemically. The City of Natchez is served by 9 water wells varying in depth from about 400 to 600 feet with a total rated capacity of 4.6 mgd. Smaller utilities serve outlying portions of the metropolitan area. Improvements are financially feasible only for the City Water Works and one of the private utilities. Planned improvements consist primarily of extending water service in the area and increasing supply capacity. Sewerage facilities within Natchez are provided by the City Water Works and, with only a few exceptions, the City is adequately sewered. Several subdivisions located outside the city limits are also connected to this system, while the rest of the area has no sewer system. No sewage treatment is provided for any of the areas. Improvements to the sewage collection and treatment system will consist of construction of a treatment plant to replace the outfall to the Mississippi River, as well as extension of sewers in all parts of the city. Storm drainage problems relate primarily to erosion of a 140 foot bluff along the Mississippi River, and other erosion problems. Extensive financial assistance will be needed for improvement of storm drainage. (Poertner)
W73-12015

URBAN SYSTEMS ENGINEERING DEMONSTRATION PROGRAM. VOLUME II: AREA-WIDE WATER AND SANITARY SEWERAGE SYSTEMS,
Diversified Consultants, Inc., Jackson, Miss.
For primary bibliographic entry see Field 05D.
W73-12017

WATER SUPPLY AND SEWERAGE PLANNING IN CENTRAL MERRIMACK VALLEY REGION: PHASE ONE.
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 05G.
W73-12043

WATER SUPPLY VOLUME OF TECHNICAL APPENDIX FOR REGIONAL UTILITIES STUDY.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 05G.
W73-12050

IMPACT OF NATURAL FACTORS ON WATER USE (VLIYANIYE PRIRODNYKH FAKTOROV NA VODOPOTREBLENIYE),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 06G.
W73-12062

CURRENT WATER USE REQUIREMENTS IN THE QU'APPELLE RIVER BASIN,
Saskatchewan Water Resources Commission, Regina. Investigation and Planning Branch.
R. L. Kellow.

Qu'Appelle Valley Project, Item 210, July, 1970. 74 p, 1 fig, 20 tab, 2 append.

Descriptors: *Water users, *Water demand, Industrial water, Municipal water, Water rights, Irrigation, *Canada.
Identifiers: Inventories, *Qu'Appelle River Basin, Saskatchewan, Regina, Moose Jaw, Melville.

The Qu'Appelle River basin has current water requirements of more than an estimated 167,000 acre-feet per year. The largest water use class is the industrial sector, especially electric power, petroleum and mining industries, and accounts for 77% of the total use. Current water requirements were determined for industries supplied by municipal water systems and by those such as electric companies, who provide their own water supplies. The second largest sector of water use was municipal. The cities of Regina, Moose Jaw and Melville accounted for 87% of this use. This sector was also subdivided into industrial, commercial, residential, and public uses. Two other sectors which had relatively small use requirements but which also could not depend on large supplies of water were rural households and communities without water systems, and stockwatering where the net consumption in 1966 in the basin is estimated to have been 1,000 acre-feet. Losses due to evaporation and losses in transmission may be substantial. Present gross requirements for stockwatering are thought to be considerably higher than the 1966 estimate. A section deals with water rights projects, e.g. irrigation projects where data on authorized irrigation projects with annual allocations greater than 9 acre-feet is used to make preliminary estimates of current irrigation water requirements. (Elfers-North Carolina)
W73-12232

REPORT ON WATER SUPPLY STUDY OF CERTAIN URBAN COMMUNITIES IN THE QU'APPELLE RIVER BASIN.
Saskatchewan Water Resources Commission, Regina. Water Rights Branch.

Prepared for the Qu'Appelle Basin Study Board, February, 1972. 43 p, 8 tab.

Descriptors: *Water supply, *Water demand, *Water requirements, Water sources, Water resources development, Projections, *Canada.
Identifiers: *Qu'Appelle River Basin, Saskatchewan, Manitoba.

This study assesses the water supplies of twenty-three communities in relation to water demands to 1985 and 2000. Water supplies were divided into three classifications: (1) supplies and systems currently being used; (2) supplies and systems that already exist but are not presently being used by the community in question; and (3) supplies that could be developed from presently undeveloped sources. These sources or supplies were also evaluated in terms of reliability, both hydrologically and potential for implementation. Some of the communities will be unable to meet future water demands under the first two classes of water supplies and thus must begin to investigate potential undeveloped sources of water. Community-by-community analysis of the three classes of water supplies relevant to each community and various conclusions in relation to future supplies plus tables of data, particularly on water demands or requirements are provided. (Elfers-North Carolina)
W73-12233

6E. Water Law and Institutions

POLLUTION CRACKDOWN.
For primary bibliographic entry see Field 05G.
W73-11785

REGISTRATION IS REQUIRED AS GOVERNMENT MOVES TO CONTROL WATER POLLUTION FROM LARGE FEEDLOTS,
For primary bibliographic entry see Field 05G.
W73-11786

SUBSURFACE INDUSTRIAL WASTE WATER INJECTION IN ILLINOIS,
Ohio River Valley Sanitation Commission, Cincinnati. Committee on Subsurface Industrial Waste Water Injection.
For primary bibliographic entry see Field 05E.
W73-11820

PRESERVING THE GREAT LAKES,
Resources Development Consultants, Inc. Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W73-11955

AN ACT PROPOSING AN AMENDMENT TO ARTICLE IV, SECTION 93, AS AMENDED, OF THE CONSTITUTION OF ALABAMA RELATIVE TO PROVIDING IRRIGATION AND WATER CONSERVATION IN THE STATE.

Act No 505, Acts of Alabama, p 1229-1230, 1971.

Descriptors: *Alabama, *Constitutional law, *Legislation, Water conservation, Distribution systems, Land development, Water rights, Irrigation programs, State governments, Government finance, Irrigation, Water resources development.

This proposed constitutional amendment provides that when authorized by the Legislature the state may, in promoting and aiding irrigation and water conservation, engage in works of internal improvement by promoting, developing, constructing, maintaining and operating within the state irrigation projects and facilities related thereto, or it may guarantee the repayment of all or a portion of any loans to any body corporate organized for such purposes under the provisions of the Alabama Constitution and pledge to the payment of such loans the full faith and credit of the State. Nothing in the bill authorizes the State, directly or indirectly, to engage in or finance the production, transmission or sale of electric power. The bill also sets out the time and place of the general election to consider passage of this bill. (Mockler-Florida)
W73-11963

DEPARTMENT OF ENVIRONMENTAL QUALITY; EXECUTIVE COMMITTEE.
Iowa Code Ann. secs. 455B.1 thru 455B.9 (Supp. 1973).

Descriptors: *Iowa, *Environmental control, *Legislation, *Waste disposal, *Water quality control, Administrative agencies, Environment, Air environment, State governments, Governments, Management, Regulations, Solid wastes, Chemical control, Administration, Comprehensive planning, Project planning, Pollution control, Inter-agency cooperation.

The Iowa Department of Environmental Quality (Department) is created, to be headed by an Executive Director (Director). The Director shall recommend the adoption of rules designed to implement the programs and services of the Department, as well as facilitate administration of the Department. He shall also contract with the public agencies of the state to provide all services necessary to implement this section. Within the Department, the Air Quality Commission, Water Quality Commission, Chemical Technology Commission and Solid Waste Disposal Commission are created. Each Commission shall advise, consult and cooperate with other Commissions, agencies and political subdivisions to accomplish its responsibilities. An executive committee composed of the

Chairmen of the four commissions and others shall review the rules proposed by the Executive Director and adopt those deemed necessary, and shall also insure integration and cooperation of the programs administered by the Department. Provisions for the organization, administration, and financing of the Department and the four commissions within the Department are included. (Glickman-Florida)
W73-11964

THE SEABED ARMS CONTROL TREATY: A STUDY IN THE CONTEMPORARY LAW OF THE MILITARY USES OF THE SEAS,
P. S. Rao.
Journal of Maritime Law and Commerce, Vol 4, No 1, p 67-92, October 1972.

Descriptors: *Treaties, *Law of the sea, *United Nations, *International waters, *Military aspects, Water law, International law, Jurisdiction, Legal aspects, Oceans, Political aspects, Continental shelf, Navigation.
Identifiers: Coastal waters, Contiguous zone.

The Seabed Arms Control Treaty was approved by the United Nations in 1970. The prohibitions agreed upon exclude all of the important contemporary military uses of the sea. The parties to the treaty will have the right to observe all seabed installations in the normal course of the exercise of the freedom of navigation. One value of the treaty lies in the classification of the status of several military uses of the seas. This comes at a time when the entire body of the contemporary law of the sea has been undergoing reexamination. During negotiations surrounding the ocean arms control measures different claims regarding the permissibility or impermissibility of certain kinds of military uses of the sea were considered. An attempt has been made to resolve the conflicts between the right of freedom to the high seas and the exclusive rights granted to the coastal states over the continental shelves. Through May 1972 some thirty-five nations (listed herein) had ratified the treaty. (Mockler-Florida)
W73-11965

DRAINAGE UNDER STATE LAWS (MINNESOTA AND ARKANSAS).

43 U.S.C. secs. 1021 thru 1048 (1970).

Descriptors: *Drainage, *Governmental interrelations, *State jurisdiction, *United States, *Legislation, Federal government, Water resources development, Jurisdiction, Legal aspects, Reserved lands, Water rights, Land use, Drainage programs, Drainage systems, Flood control, Water management (Applied), Public lands, Federal jurisdiction, Indian reservations, Arkansas, Minnesota.

All of the unentered, unreserved public lands and all of those entered lands in Minnesota and Arkansas for which no final certificates have been issued are made subject to the laws of the state in which they are located. However, it is also provided that the United States and all persons holding unpatented lands under entries made under the public land laws of the United States shall be accorded all the rights given by the state laws to persons holding lands in private ownership. In addition to the subjection of these lands to state laws for drainage for agricultural purposes, the statutes also provide for apportionment of the costs, patents, transfer of lands, issuance of patents, claims, imposition of liens or assessments on federal lands or any ceded or other Indian lands, title to lands, consent of owners of Indian lands, homestead rights, all lands not affected, and canals, ditches, levees, and other drainage works. Moreover, a complete breakdown on the transfer of various functions from federal agencies to the states is also provided. (Mockler-Florida)
W73-11966

BRICKELL V. TRAMMELL (TITLE SUIT TO DETERMINE OWNERSHIP OF SUBMERGED LANDS ALONG NAVIGABLE BODY OF WATER).
82 So. 221-230 (Fla. 1919).

Descriptors: *Florida, *Navigable waters, *Public rights, *Judicial decisions, *Riparian rights, Submerged lands, Equity, Common law, Legal aspects, Water rights, Ownership of beds, High water mark, Watercourses (Legal aspects), Low water mark, Boundaries (Property), Easements, Tidewaters, Channels, Bulkheads, Beds, Legal review.
Identifiers: *Injunctions (Prohibitory), Sovereign states, Title disputes (Submerged land), Constitutional effects (Federal), Trustees of the Internal Improvement Fund.

Appellant, riparian landowner, claimed fee simple ownership to portions of submerged land extending to the natural channel of Biscayne Bay and to a certain partially submerged tract or island. She alleged that certain dredge and fill activities had rendered the submerged lands navigable, and that over her objections appellees, the Trustees of the Internal Improvement Fund, had sold, but not delivered, the deed to the partially submerged island to a third party. Appellant requested an injunction restraining delivery of such deed and that the trustees be adjudged unauthorized to sell such island. The complaint did not exhibit paper title from any sovereignty. Appellant claimed here predecessors in title had such fee simple title by virtue of an 1856 legislative act. The court held for the trustees. It held that the 1856 act only granted easements to those riparian owners who owned property to the high water mark, and that all other submerged lands were owned by the sovereign state. There was nothing in the title to the original grantor that indicated she received title to said low water mark, no adequate proof of such ownership by the complainant. The state of Florida was found to hold the submerged property in trust for the people of the state, and the trustees could properly dispose of same. (Smith-Adam-Florida)
W73-11967

BURNS V. COASTAL PETROLEUM COMPANY (ACTION TO DETERMINE WHETHER BOTTOM OF LAKE WAS INCLUDED WITHIN OIL AND MINERAL LEASE).

194 So. 2d 71-76 (1st D.C.A. Fla. 1966).

Descriptors: *Florida, *Leases, *Oil industry, *Lake beds, Legal aspects, Adjacent landowners, Contracts, Judicial decisions, State jurisdiction, Legal review, Exploration, Flow channel flow, Legislation, Gulf of Mexico, Boundaries (Property), Oil fields, Mining.
Identifiers: *Legislative interpretation, Trustees of the Internal Improvement Fund (Florida).

Appellants, Trustees of the Internal Improvement Fund, appealed from a declaratory decree holding that the water bottom of Lake Hancock was included within an oil and mineral lease executed by the Trustees to appellees, Coastal Petroleum Company. The court found that oil and mineral rights were not so conveyed. The contract and lease had not been intended to include all state-owned water bottoms which were connected by natural streams to certain named rivers. Extrinsic evidence was disallowed as the lease was sufficiently definite on its face, and the lease documents meant exactly what they said; that is, that the water bottoms covered included only those rivers and lakes named therein. A petition for rehearing was filed which was denied. (Smith-Adam-Florida)
W73-11968

WATER RIGHT CHANGES TO IMPLEMENT WATER MANAGEMENT TECHNOLOGY,
Colorado State Univ., Fort Collins.
G. E. Radosevich.
In: Managing Irrigated Agriculture to Improve Water Quality, Proceedings of National Conference on Managing Irrigated Agriculture to Improve Water Quality, Colorado State University, May 16-18, 1972. p 265-279, (1972) 27 ref.

Descriptors: *Water rights, *Prior appropriation, *Water management (Applied), *Water distribution (Applied), *Water quality control, Irrigation, Agriculture, Legal aspects, Administration, Comprehensive planning, Water law, Irrigated land, Water allocation (Policy), Institutional constraints, Technology, Judicial decisions.

The institutionalization is explored of a legal and organizational system that has directed the course of allocation, distribution and utilization of water in semi-arid western states. One of the dominant features of this system is the concept of a property right in water. This property right concept is at the root of current water problems; through the exercise of this right, not only the quantity but also the quality of water is affected. Both of these aspects are an integral part of effective water management and are discussed. A general discussion of the appropriation doctrine and the nature of the water right concept is included; however, the crux lies with the call for a reassessment of present legal and organizational machinery in light of water demands, water use practices and technological innovation. Changes in the exercise of water rights to induce or require more efficient uses of the resource must and can be made. The water problems of the western states demand a new, flexible and pragmatic solution. (Mockler-Florida)
W73-11969

PROCEDURAL REGULATIONS OF THE NEW ALABAMA WATER IMPROVEMENT COMMISSION,
Union Bank and Trust Co., Montgomery, Ala.
H. A. Leslie.
Alabama Lawyer, Vol 34, p 72-79, Jan 1973. 3 ref.

Descriptors: *Alabama, *Adjudication procedure, *Water pollution control, *Administrative agencies, Water quality standards, Pollution abatement, Regulation, Waste disposal, State governments, Effluents.
Identifiers: *Administrative regulations, *Alabama Water Improvement Commission.

Procedural Regulations of the Alabama Water Improvement Commission were adopted on May 29, 1972. The commission was a product of public demand for strengthening laws relating to water pollution. The regulations provide, among other things, that the Commission shall: adopt regulations establishing water quality standards, adopt effluent limitation guidelines, stream classifications, and any other regulations necessary to control pollution in state waters. All rules and other written statements of policy or interpretations formulated are to be made available for public inspection as are all final orders, decisions, opinions, records, reports or information. Adoption, amendment or repeal of regulations may be formally proposed by a member of the Commission, Chief Administrative Officer, Commissioner of Department of Conservation and Natural Resources, Commissioner of Agriculture and Industries, the State Geologist, the Director of the Alabama Development Office, Attorney General or by petition of 50 or more citizens of the state. The regulations conclude with procedures for adoption of new regulations. (Napolitano-Florida)
W73-11970

UTILIZATION OF GROUND WATER RESOURCES.

La. Rev. Stat. secs. 38:3091 thru 38:3097 (Supp. 1973).

Descriptors: *Louisiana, *Legislation, *Groundwater resources, *Well regulations, *Groundwater mining, Water management (Applied), Water wells, Wells, Administrative agencies, Administrative decisions, Legal aspects, Comprehensive planning, Penalties (Legal), Water supply, Water yield, Regulation, Inspection, Water policy, Water rights, Control systems, Water sources, Subsurface waters.

The Director of the Louisiana Department of Public Works is required to make reasonable rules and regulations regarding the registration of water wells and classification of their use, renewal and application for such registration, to establish regulations regarding the construction of certain water wells, to gather data with respect to existing and future flowing wells, and to regulate the abandoning and sealing of such wells. The director is given authority to hold hearings, to collect data, to authorize personnel to make property inspections, to receive grants and enter into contracts for ground water resources development, to conduct studies in this area, to require the keeping of records regarding use of ground water, and to cooperate with other governmental units to achieve water conservation. Penalties for the violation of provisions under this chapter are set forth. (Dunham-Florida)
W73-11971

KANSAS-NEBRASKA BIG BLUE RIVER COMPACT.
Hearing--Subcomm. on Water and Power Resources--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong. 2d Sess, February 23, 1972. 48 p.

Descriptors: *Governmental interrelations, *Interstate compacts, *River basin development, *Appropriation, Federal government, Kansas, Nebraska, Legislation, Administrative agencies, Interstate rivers, Water law, Legal aspects, Administration, Water resources development, Comprehensive planning, Water supply, Water pollution control, Water rights, Priorities, Preferences (Water rights), Interstate Commissions.
Identifiers: *Congressional hearings, *Big Blue River (Kansas and Nebraska).

Hearings were held to take testimony on proposed legislation to consent to the Kansas-Nebraska Big Blue River Compact which was already ratified by the two states. The compact is designed to apportion the waters of the Big Blue River Basin between Kansas and Nebraska, to promote the orderly development of these waters, and to reduce water pollution. The compact creates a compact administration composed of representatives of each state and a non-voting federal member to administer the compact and specifies its functions. Restrictions on water rights and use are placed on both states for their mutual benefit. Included are texts of both Senate and House bills consenting to the compact, reports from interested federal agencies, and statements and testimony of witnesses at the hearing. (Dunham-Florida)
W73-11972

MARINE SANCTUARIES IN CALIFORNIA.

Hearings--Subcomm. on Minerals, Materials, and Fuels--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 1st Sess, November 1 and 4, 1971. 163 p, 1 plate.

Descriptors: *Legislation, *Continental shelf, *Mineral industry, *Beds under water, Oil, Water pollution control, Legal aspects, Tidal waters, Beds, Mining, Environmental effects, California, Leases, Oceans, Federal jurisdiction.
Identifiers: *Outer Continental Shelf Lands Act, *Congressional hearing.

Testimony was taken on legislation which would create seven marine sanctuaries pursuant to the Outer Continental Shelf Lands Act in areas off the coast of California adjacent to state-owned submerged lands in which the state has already suspended leasing for mineral purposes. Specifically, the purpose of the bill is to create the marine sanctuaries along 250 miles of California Outer Continental Shelf lands, to suspend leasing activities over such lands and to establish a congressional policy with regard to such lands. The legislation provides that the Secretary of the Interior shall suspend all further leasing pursuant to the Outer Continental Shelf Lands Act for the exploration for or extraction of oil, gas, or any other mineral in the portion of the Outer Continental Shelf. Such suspension could be terminated by the President in the event of a declared national emergency; nothing in the act would be deemed to authorize the Secretary to terminate or refuse to renew any lease, to limit any authority to grant rights-of-way, to prohibit any exploration of the Outer Continental Shelf or to grant to the State of California any title or jurisdiction over any portion of the Outer Continental Shelf. (Mockler-Florida)
W73-11973

COASTAL PLAINS REGIONAL COMMISSION--ANNUAL REPORT, 1972.

(1972) 28 p, 25 photo, 1 chart.

Descriptors: *Estuaries, *Atlantic Coastal Plain, *Area redevelopment, *Fish management, *Shellfish farming, Water pollution control, Conservation, Shore protection, Coastal marshes, Fishing, Research and development, North Carolina, Georgia, South Carolina, Grants, Governmental interrelations, Interstate commissions, Federal government, Government finance.

The Coastal Plains Regional Commission's primary task is to plan and implement an attack on the economic conditions which cause an annual loss of over five billion dollars in income to the residents of North Carolina, South Carolina, and Georgia. This report of the Commission's activities covers the period of July 1, 1971 through June 30, 1972. Six hundred miles of coastline and millions of acres of relatively unpolluted estuaries is the region's greatest natural asset. The Commission opened fiscal year 1972 with a $2.4 million grant to help finance construction of a multi-purpose marine resource center in North Carolina, the dedication of the Fort Johnson Marine Resources Center in South Carolina, and for construction of a shell fish facility on Skidaway Island in Georgia. A clam hatchery and oyster-culture operation in North Carolina also received continued Commission support. In addition, the Commission contributed $100,000 to assist the expansion of South Carolina's Bonneau Fish Hatchery and donated $59,000 for an analysis of the structure and marketing practices of the sea food industry. (Mockler-Florida)
W73-11974

SABINE RIVER AUTHORITY.
La. Const. art. 14 sec. 45 (Supp. 1973).

Descriptors: *Louisiana, *Constitutional law, *River basin commissions, *Watershed management, River basin development, Navigation, Flood control, Agriculture, Irrigation, Recreation, Planning, Land management, Legislation, Jurisdiction, Drainage, Hydroelectric power, Governmental interrelations, Water supply development.

The Sabine River Authority is created as an approved instrumentality and agency of the state of Louisiana. Jurisdiction of the authority shall include those parishes or portions of parishes as the legislature may determine, with the view of improving navigation on the Sabine River and its tributaries, providing for adequate drainage and flood control within the Sabine River and the Calcasieu River watersheds, thus utilizing the waters of the Sabine River and its tributaries for the purpose of providing recreation and irrigation, attracting industry to the area, maintaining an adequate water supply for agricultural, municipal, domestic, and industrial use in the Sabine and Calcasieu River watersheds, and for the development of hydroelectric power. The Authority shall be fully authorized to cooperate financially with the U.S. government, the state of Texas and Louisiana and with any political subdivision or agency of these states, as well as the federal government. (Mockler-Florida)
W73-11975

POLLUTION CONTROL UNDER THE PENNSYLVANIA CLEAN STREAMS LAW,
A. Charlson.
University of Pittsburgh Law Review, Vol 34, p 115-129, Fall 1972. 51 ref.

Descriptors: *Pennsylvania, *Mine wastes, *Judicial decisions, *Legislation, Water pollution control, Legal aspects, Waste water disposal, Water quality standards, Law enforcement, Water policy, Mine drainage, Mine water, Water pollution sources, Permits.

The authority of the Commonwealth of Pennsylvania under the Clean Streams Law to control mine drainage pollution has been severely limited in two recent decisions of the Commonwealth Court. In one case, the court held that the operator of an active mine could not be compelled by the Commonwealth to treat polluted water which it pumped from an adjacent inactive mine for the purpose of protecting its active workings. It was held in this case there was no 'mine' within the applicable statutory provision. In the second case polluted water flowed underground from inactive workings into an active mine, commingled with other waters, and subsequently was discharged together with water originating in the active mine. The Court there held there was no 'mine drainage' within the statute and thus no violation of the statute. The court has also required a more stringent standard of fault than is necessary in a system which regulates effluent quality. The Commonwealth Court has erred in its strict interpretation of the Clean Streams Law in these two decisions; there is no reason that liability should not attach every time there is a waste discharge into the waters of the Commonwealth. (Mockler-Florida)
W73-11976

BOWIE DAM AND LAKE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 08A.
W73-11977

FLOOD AND EROSION CONTROL.

Iowa Code Ann. secs. 467B.1 thru 467B.15 (1971).

Descriptors: *Iowa, *Flood control, *Soil conservation, *Water conservation, *Legislation, Water policy, Federal government, Local governments, Governmental interrelations, Flood protection, Soil erosion, Public health, Water resources development, Government finance, Grants, Levees, Structures, Federal project policy, Water management (Applied).

Whenever any political subdivision or agency of the state of Iowa shall engage in any project for flood or erosion control, flood prevention or the conservation, development and disposal of water in cooperation with the federal government, the counties in which the project is carried on shall have the authority through the Board of Super-

visors to maintain that project on county lands. Any county may accept federal funds for any such project. The various governmental units involved in these projects may consult and cooperate with each other. When structures or levees necessary for flood or soil conservation control are constructed on county roads, they shall be considered part of the cost of road construction. When projects have been completed on private lands under easement granted to the county, the cost of maintenance may be assumed by the county. Conservation commissioners shall inspect all flood and erosion control structures. Funds received from the federal government because of operations of federal flood control projects shall be allocated between schools, roads and other functions. (Glickman-Florida)
W73-11978

SOIL CONSERVATION AND FLOOD CONTROL DISTRICTS.
Iowa Code Ann. secs. 467C.1 thru 467C.6 (1971).

Descriptors: *Legislation, *Flood control, *Iowa, *Soil conservation, Natural resources, Water resources, Erosion control, Soil erosion, Water conservation, Surface waters, Public health, Water policy, Water management (Applied), Strip mines, Drainage districts, Water districts, Levee districts, Flood protection, Water resources development, Land use, Coal mines.

The conservation of the soil resources, the proper control of water resources, flood prevention and the drainage of surface waters shall be a considered public benefit, conducive to the public health and welfare of the state of Iowa. The County Board of Supervisors (Board) may create districts for soil conservation and flood control, and shall construct improvements deemed essential to accomplish those purposes. The Board may also supervise strip coal mining, to insure that all surface soil is replaced upon abandonment of any mining operation. These new districts may encompass old levee or drainage districts that wish to be included in the conservation and control projects. No proposed district shall be established without the approval of the commissioners of any soil conservation district included all or in part within the proposed districts. (Glickman-Florida)
W73-11979

AN ACT RELATING TO IRRIGATION AND WATER CONSERVATION.
Act No 980, Acts of Arkansas, p 1750-1752, 1971.

Descriptors: *Alabama, *Legislation, *Irrigation, *Water conservation, *Irrigation programs, Conservation, Distribution systems, Land development, Irrigation districts, Water conveyance, Governmental interrelations, Government finance, Constitutional law, Cost sharing.

This act authorizes the state to provide financial assistance and to underwrite and guarantee costs of a pilot irrigation and water conservation project and related facilities. Moreover, it authorizes the state of Arkansas to create a state irrigation development trust fund and provides for the use of the fund. It also provides that any such project shall remain under the supervision and control of the state until all monies owed are repaid. The act becomes effective upon ratification of an amendment to the Alabama Constitution to authorize the legislature to pass laws authorizing the state to aid in promoting and developing irrigation and water conservation. The state may also enter into agreements with any federal agency directly or through an irrigation district whereby the federal government will render financial assistance to such projects. (Mockler-Florida)
W73-11980

INTERSTATE DRAINAGE DISTRICTS.
Iowa Code Ann. secs. 467.1 thru 467.6 (1971).

Descriptors: *Iowa, *Drainage districts, *Governmental interrelations, *Drainage systems, *Legislation, Drainage area, State governments, Legal aspects, Administrative agencies, Water law, Water policy, Inter-agency cooperation, Bond issues, Contracts, Bids, Comprehensive planning, Project planning, Equitable apportionment, Interstate compacts, Public benefits, Administration, Water management (Applied).

Before the final establishment of a drainage district bordering on the Iowa state line, the authorities of this state may hold a hearing to determine the feasibility of a joint project with the drainage district in a bordering state. The Board of Supervisors shall have the power to enter into an agreement as to amounts the property owners of each state should pay toward construction of the joint undertaking. Acceptance of construction bids must be by both states jointly, although contracts for construction of those portions of the project within the state shall be separate from that of the neighboring state. This state may make agreements with the adjoining state for the joint management, repair and maintenance of such improvements. No bonds shall be issued until all litigation in both states shall have been terminated. (Glickman-Florida)
W73-11981

OPERATION OF WATERCRAFT.
Ind. Ann. Stat. secs. 68-813 thru 68-871 (Supp. 1972).

Descriptors: *Indiana, *Legislation, *Boats, *Boating regulations, Navigation, Transportation, Recreation wastes, Pontoons, Recreation, Regulation, Inspection, Permits, Penalties (Legal), Administration, Legal aspects, Local governments.

Speed limits, disposal regulations, toilet regulations, life preserver requirements and restrictions on the operation of watercraft near shorelines are specified in the statute. The operation of a powered watercraft by children, with certain exceptions, is prohibited. The Indiana department of conservation is authorized to etablish speed limits for watercraft and to prescribe areas for special use on lakes and for federal reservoirs financed either wholly or in part with state and/or federal funds. Sitting or standing on gunwales or bow decking and boat racing, with certain exceptions, are prohibited. Lights are required on pontooned boats. The duties of the department are stated in the statute. The department has the authority to promulgate and amend certain rules and regulations. (Reed-Florida)
W73-11982

LITTLE CALUMET RIVER BASIN COMMISSION.
Ind. Ann. Stat. secs. 68-1601 thru 68-1607 (Supp. 1972).

Descriptors: *Indiana, *Legislation, *Water resources development, *River basin commissions, *River basin development, River basins, Planning, Watersheds, River systems, River regulation, Streamflow, Regulation, Comprehensive planning, Land management, Governmental interrelations, State governments, Illinois, Administrative agencies.

The Little Calumet River Basin Commission (Commission) is established for the purpose of coordinating the development of the river basin and shall cooperate with the regional planning commission in the preparation of a comprehensive development plan for the basin. The activity of this Commission is limited to that part of the Little Calumet River Basin which begins at the point where Burns Ditch empties into Lake Michigan and runs southerly and westerly to the Indiana-Illinois state line. The Commission may conduct all necessary studies for the accomplishment of its duties. It may publicize and advertise its purposes, objectives, and findings; may provide recommendations when requested to the political subdivisions within the basin; and may act when requested as a coordinating agency for programs and activities of such agencies as they relate to its objectives. Moreover, the Commission may acquire and use such property as the Commission may deem necessary for the development in the corridor or contiguous areas. Also, the Commission may enter into agreements with duly constituted agencies in Illinois which are responsible for the planning and development of the entire Little Calumet River Basin in Illinois. Provisions relating to Commission membership, administration, and project financing are included. (Mockler-Florida)
W73-11983

GREAT LAKES RIVER BASINS COMMISSION.
Ind. Ann. Stat. secs. 68-1401 thru 68-1404 (Supp. 1972).

Descriptors: *Indiana, *Great Lakes, *River basin development, Water resources development, Water quality control, Planning, Land use, River basins, Water pollution control, *River basin commissions, Comprehensive planning, Administrative agencies, Governmental interrelations, State governments, Interstate commissions, St. Lawrence River, Optimum development plans.

The membership of the state of Indiana in the Great Lakes River Basins Commission, established by a presidential executive order, is ratified. The Indiana member of this Commission is to be appointed by the Governor for an indefinite period and the Department of Natural Resources shall provide administrative, technical and advisory services to the member. The functions and duties of the Commission are to serve as the principal agency for the coordination of federal, state, interstate, local and nongovernmental plans for the development of water and related land resources within those portions of the eight Great Lakes states which are or were in their natural state drained by the St. Lawrence River system; to prepare and keep up to date a comprehensive, coordinated joint plan; and to recommend long-range schedules of priorities for the collection and analysis of basic data and for investigation, planning, and construction of projects. The statutes also provide that the plans shall include an evaluation of all reasonable alternative means of achieving optimum development of water and related land resources of the basins. (Mockler-Florida)
W73-11984

ENVIRONMENTAL HEALTH (CONSTRUCTION SITE REGULATIONS).
Ind. Admin. Rules and Reg. secs. (40-2139)-L74 thru (40-2139)-L81 (Supp. 1972).

Descriptors: *Indiana, *Public health, *Sewage disposal, *Water quality standards, Water quality control, Water sources, Water supply, Water treatment, Waste treatment, Potable water, Safety, Environmental sanitation, Water purification, Administrative agencies, Administrative decisions.
Identifiers: *Administrative regulations, *Construction sites, Potable water standards, Toilet facilities, Washing facilities.

These provisions contain minimum requirements for sanitation and health on construction work sites. The rules cover drinking water standards, water sources, water supply standards for employee washing facilities, drinking water transportation and dispensing, non-potable water sources, water discharge points, toilet and washing facilities, and sewage disposal. The rules provide that the requirements outlined for sanitation and health are minimum requirements and shall not supersede, take precedence, or invalidate any rules,

regulations, orders, or directives of the Indiana state board of health or any other state or local agency that may be more stringent or additional to the requirements stated. An exception to the rules provides that for routine maintenance and repair and nonfixed construction work such as signal and line work, railroad and highway work, and pipeline work, the toilet and washing facilities and the sewage disposal facilities required by the regulations may be waived or varied by the commissioner of labor. (Mockler-Florida)
W73-11985

ENVIRONMENTAL MANAGEMENT.

Ind. Ann. Stat. secs. 35-5201 thru 35-5265 (Supp. 1972).

Descriptors: *Legislation, *Administrative agencies, *Indiana, Water quality control, Water pollution control, Public health, Sewage treatment, Legal aspects, Water resources development, Comprehensive planning, Waste disposal, Adjudication procedure, Administrative decisions, Permits, Law enforcement, Treatment facilities, Water supply, Penalties (Legal).
Identifiers: Administrative regulations.

The Indiana environmental management board (Board shall maintain a long term comprehensive plan for the development and control of the state's natural resources; adopt regulations to protect the environment; inspect refuse disposal sites, public water supplies and pollution sources; and assist local governments in developing programs for such actions as water pollution control. All powers and duties of the state board of health are transferred to the Board; other powers are expressly enumerated. Also included are provisions for Board membership, meetings, adopting rules and regulations and hearings. The Board may prescribe regulations for water wells, drainage holes and standards for waste discharges into waters of the state. Permits for the construction and operation of public water supply facilities and water pollution control facilities must be obtained from the Board. The Board is charged with investigating and enforcing violations of this Article. Provisions for hearings and appeals are included. (Mockler-Florida)
W73-11986

FLOOD CONTROL.

Ind. Ann. stat. secs. 27-1101 thru 27-1134 (1970).

Descriptors: *Indiana, *Legislation, *Flood control, *Flood protection, *Water resources development, Water management (Applied), Floods, Channel improvement, Civil engineering, Flood damage, Water policy, Flood proofing, Water resources, Legal review, Water conservation, Economics, Programs, Project planning, Administration, Legal aspects, Planning, Administrative agencies.
Identifiers: Nuisance (Legal aspects).

The duties and powers of the Indiana Flood Control and Water Resources Commission (Commission) are specified. The Commission has the power to commence, maintain and prosecute any appropriate action to enjoin or abate a nuisance which adversely affects flood control or the safety of life or property. To prevent and limit floods, all flood control works and structures, the alteration of watercourses of all rivers and streams are to be regulated, supervised and coordinated in design, construction and operation according to sound and accepted engineering practice. Channels and floodways are to be kept free of obstructions. Water resources are to be accumulated and preserved. A master plan for the entire state to control floods and preserve the water resources is to be prepared. A flood control revolving fund, from which loans may be made to municipalities, is established. Municipalities are authorized to institute flood control programs in cooperation with state policy and project planning. (Reed-Florida)
W73-11987

BENEFITED WATER DISTRICTS.

Iowa Code Ann. secs. 357.1 thru 357.34 (Supp. 1973).

Descriptors: *Iowa, *Water districts, *Legislation, *Water supply development, Legal aspects, Local governments, Governmental interrelations, Water policy, Water, Water rights, Assessments, Value, Taxes, Management, Administrative agencies, Water resources development, Project planning, Water utilization, Public benefits.

Upon the petition of 25% of the resident property owners, the County Board of Supervisors (Board), shall grant a hearing relative to the establishment of a water district. If the proposed district is to be located wholly within a city or town, the city or town council shall have the authority to establish the water district. If the preliminary design and assessment are approved by the County Board, a date for an election shall be set. The election shall be to determine whether the improvement shall be constructed, and to choose trustees for the district. After a final acceptance of the work by the Board, the engineer shall complete a final assessment based on all the property in the district. The Board of Supervisors may alter an assessment by increasing or decreasing it. Where a town or city is wholly within a benefited water district, the Board having jurisdiction of that district may convey it and all rights in and to it to that city or town. (Glickman-Florida)
W73-11988

UPPER MISSISSIPPI RIVERWAY COMPACT.
Iowa Code Ann. secs. 27A.1 thru 27A.6 (Supp. 1973).

Descriptors: *Iowa, *River basin development, *Legislation, *Interstate compacts, *Mississippi River, River basin commission, Natural resources, Rivers, Legal aspects, Legislation, Administrative agencies, Ecology, Recreation, Recreation facilities, Fishing, Social needs, Wildlife, Water resources, State governments, Governmental interrelations, Management, Public benefits, Public lands, Interstate rivers.
Identifiers: Public trust doctrine.

The Upper Mississippi Riverway Compact is established and entered into by all adjoining states. The purpose of the compact is to secure the benefits that can accrue from the preservation, use and development of the scenery, recreational opportunities, fisheries, wildlife, water resources and other natural assets of the river. The party states shall cooperate in preserving and protecting the natural and recreational resources of the area. The Upper Mississippi Riverway District (District) is established, to be managed by the Upper Mississippi Riverway Commission (Commission). The Commission shall have the power to operate all recreational facilities within the District and to conduct studies and develop recommendations for the protection, use, and development, in the public interest, of the lands and waters in and affecting the District. The Commission may acquire easements or make such agreements that may be suitable for establishing patterns of land and water use consistent with this compact. The Commission may enter into necessary agreements with any agency of the State of Iowa, but none of the functions of the Riverway District shall limit the powers of governmental units within the state. Provisions are included for the administration of the Commission and financing of Commission projects. (Glickman-Florida)
W73-11989

PROTECTION FROM FLOODS.

Iowa Code Ann. secs. 395.1 thru 395.35 (Supp. 1973).

Descriptors: *Iowa, *Condemnation, *Flood control, *Legislation, Watercourses (Legal aspects), Flood damage, Flood routing, Diversion structures, Flood protection, Structure, Levees, Floodways, Floodproofing, Bond issues, Right-of-way, Assessments, Governmental interrelations, Cities, Public health, Water management (Applied), Water policy, Financing, Project planning.

Cities and towns are authorized to establish a flood control system for the protection of property within their limits from floods and their effects. They may alter watercourses by improving and widening watercourses or other projects designed for flood control. Cities and towns may purchase or condemn private property as well as rights-of-way if it is necessary to carry out the provisions of this chapter. The title of all property condemned to establish a flood control system shall be taken in the name of the city or town; and, if the land is later sold, the proceeds shall be credited to the flood control system. To pay for the cost of contemplated improvements, bond issues are authorized. In addition, the cities and towns may accept federal aid in developing their systems. City Councils shall be allowed to allocate portions of the street fund to the project, as well as authorizing special assessments against real property. The work to be done may be divided into sections, and each section may be developed separately. Cities and towns are also authorized to issue bonds to pay expenses. (Glickman-Florida)
W73-11990

WATER QUALITY COMMISSION.
Iowa Code Ann. secs. 455B.30 thru 455B.74 (Supp. 1973).

Descriptors: *Iowa, *Water pollution control, *Water quality standards, *Waste water (Pollution), Administrative agencies, Legislation, Water quality, Regulation, Water pollution, Water policy, Water quality control, Public health, Pollution abatement, Waste water disposal, Waste water treatment, Law enforcement, Permits, Sewage treatment, Financing, Detergents, Legal review, Legal aspects, Personnel.
Identifiers: Licenses.

The Iowa Water Quality Commission (Commission) shall develop comprehensive plans and programs for the prevention, control and abatement of water pollution. It shall establish water quality standards for the water of the state, as well as develop rules specifying the conditions under which the Commission shall issue or deny permits for the installation or operation of disposal systems for the discharge of sewage or other wastes. The Commission shall implement rules governing the labeling of detergents which contain phosphorous. The Commission shall hold hearings on the implementation and enforcement of the rules it establishes. The Executive Director shall classify water treatment plants or water distribution systems in accordance with the skill and experience an operator must have to run the plant so as to protect the public health and prevent pollution, and every operator must be certified to handle his particular position. No plant shall operate except under the direction of a certified operator. The Commission shall administer the Sewage Works Construction Fund, giving consideration to the public benefit and ultimate cost of any project. (Glickman-Florida)
W73-11991

MILLDAMS AND RACES.

Iowa Code Ann. secs. 469.1 thru 469.31 (1971).

Descriptors: *Iowa, *Mill dams, *Water pollution control, *Legislation, *Legal review, Embankments, Regulation, Water policy, Dams, Environmental effects, Riparian rights, Public health, Permits, Water pollution, Water quality control, Industrial wastes, Mills, Legal aspects, Dam construction, Dam design, Administrative decisions, Administrative agencies, State governments, Water management (Applied).
Identifiers: *Races.

No dam shall be constructed or maintained in any navigable stream, or in any other stream for manufacturing or power purposes, nor shall any water be taken from such streams for industrial purposes unless a permit has been granted by the Iowa Natural Resources Council. Upon application for a permit and a hearing, if it appears that the dam will not obstruct existing navigation or affect other public rights, or endanger public health, the Council shall grant the permit. If water is to be used for manufacturing purposes, application must be approved by the Water Pollution Control Commission. The Natural Resources Council shall investigate means of constructing and maintaining dams so as to best conserve and protect all public and riparian rights. When the water backed up by a dam belonging to a mill is about to overflow the banks and injure machinery, the owner of the mill may repair the embankments to prevent the damage. Any person using a water power for the purpose of propelling machinery shall have the right to acquire the fall below such power. Specific provisions relating to the procedure for receiving a permit to construct a dam are included. Penalties for non-compliance with the chapter are also provided. (Glickman-Florida)
W73-11992

BIG CYPRESS PRESERVE, FLORIDA.

Hearings-Subcomm. on National Parks and Recreation–Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, February 15 and September 26, 1972. 180 p.

Descriptors: *Watershed management, *Legislation, *Eminent domain, *Water management (Applied), Water quality control, Freshwater, Wetlands, Water supply, Water sources, Federal jurisdiction, Condemnation, Land management, Land use, Water conservation, Surface drainage, Swamps, Florida, Land development, Environmental effects.
Identifiers: *Environmental Impact Statements, *Big Cypress Swamp, *Congressional hearings, Everglades.

H.R. 10410 would authorize the Secretary of the Interior to acquire certain lands within the Big Cypress watershed in Florida; other bills would authorize the acquisition of the Big Cypress national fresh water reserve in Florida. The basic purpose of this field hearing was to hear testimony from people in the local area. Representatives of state and local agencies testified at this hearing with reference to these proposed bills. Upon passage, the Secretary of the Interior would be authorized to enter into an agreement with the state or local unit of government for the purposes of managing and administering the area. The use of the lands would be limited so as to assure the flow of fresh water into the park. The use of motorized vehicles, mineral exploitation, grazing, and agricultural pursuits would be closely regulated. Hunting and trapping would continue subject to reasonable controls. The aim of the proposal is to protect the fresh water resources in Big Cypress Watershed and thereby protect the water quality, quantity and flow regimen to the northwest portion of Everglades National Park, as well as the estuarine regions and the water supplies of the cities and towns in Southwest Florida. (Mockler-Florida)
W73-11993

DEEP DRAFT HARBOR AND TERMINAL AUTHORITY.

La. Rev. Stat. secs. 34:3101 thru 34:3114 (Supp. 1973).

Descriptors: *Louisiana, *Legislation, *Harbors, *Port authorities, *Environmental effects, Coastal structures, Transportation, Shore protection, Coastal engineering, Deep water, Regulation, Governmental interrelations, Navigation, Ships, Project planning, Comprehensive planning, Administrative agencies, Public benefits.
Identifiers: *Deep draft harbors.

The object is to provide for the creation of the Deep Draft Harbor and Terminal Authority (Authority) possessing full corporate powers, to promote, plan, finance, develop, construct, control, operate, manage, maintain and modify a deep draft harbor and terminal within the jurisdiction of this Authority in order to promote the economic welfare of state citizens and to provide the necessary facilities for docking, loading, and unloading of vessels carrying liquid or dry bulk and energy cargoes. Additional purposes include the promotion of port operations, the protection of environmental values and Louisiana's coastal marshland ecosystem, and the promotion of the industrial and petrochemical base of the Mississippi Valley region of the United States by providing adequate deep draft port facilities for the handling of the cargoes of deep draft vessels. Following a list of applicable definitions, the statutes cover jurisdiction, terms and qualifications of Board of Commissioners to govern the authority, board duties, annual reports, public contracts, and procedures for issuance of bonds. A detailed environmental protection plan is required to be prepared and followed in the carrying out of any Authority project. (Mockler-Florida)
W73-11994

JACKSON-BIENVILLE PARISHES DUGDEMONA WATERSHED DISTRICT.

La. Rev. Stat. secs. 38:3000 thru 38:3014 (Supp. 1973).

Descriptors: *Louisiana, *Legislation, *Watershed management, *Water yield improvement, *Water districts, Water conservation, Water use, Water utilization, Water management (Applied), Watersheds (Basins), Water supply, Water storage, Soil management, Soil conservation, Wildlife management, State governments, Area redevelopment, Project planning, Artificial lakes, Public benefits.

The Jackson-Bienville Parishes Watershed District (District) is created for the purpose of soil and water conservation, development of natural resources, and for the creation and maintenance of a lake for the benefit and health of the citizens of the state. The District shall constitute a body corporate and shall be a state agency. The District shall be governed by a Board of Commissioners, (Commissioners), who are empowered to buy and sell land, contract for projects, create administrative rules and regulations, and levy taxes in fulfilling their obligations under these provisions. Specific procedures relating to the imposition of taxes are set forth. The Commission is particularly directed to preserving and improving available fresh water supplies in the area encompassed by the newly created district; it is authorized to cooperate with other governmental agencies in areas such as recreational facilities, fish and wildlife management, and budgetary matters. (Dunham-Florida)
W73-11995

GREATER BATON ROUGE WATER CONSERVATION DISTRICT.
La. Rev. Stat. secs. 38:3051 thru 38:3057 (Supp. 1973).

Descriptors: *Louisiana, *Legislation, *Groundwater resources, *Water districts, *Water management (Applied), Administrative agencies, Regulation, Legal aspects, Comprehensive planning, Project purposes, Local governments, Water supply, Water yield, Water utilization, Water policy, Control systems, Subsurface waters, Encroachment, Water conservation, Ecology, Environmental effects.

The governing body of the parish of East Baton Rouge, Louisiana is empowered to create a special conservation district within the parish and a Water Conservation Commission (Commission) to administer and regulate such conservation district. The Commission is empowered to study groundwater conditions with the view of water conservation, particularly on the possible effects of salt water encroachment, and to determine ways and means of protecting groundwater conditions in all aspects, including depletion and detrimental salt water encroachment. Consideration shall be given to the requirements of industry, agriculture and domestic consumption. The Commission shall make appropriate recommendations for any preventive or remedial action. Provisions for the make-up of the Commission membership, expansion of the special conservation district to other parishes, cooperative agreements with other governmental units, and technical assistance are included. (Dunham-Florida)
W73-11996

BREVARD COUNTY BEACH EROSION CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08A.
W73-11997

ENVIRONMENTAL LAW ABSTRACTS, VOLUME II,
Oak Ridge National Lab., Tenn. Environmental Information Systems Office.
For primary bibliographic entry see Field 10C.
W73-11998

KEHOE LAKE, TYGARTS CREEK, KENTUCKY (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from National Technical Information Service, as EIS-KY-72-5290-F, $6.00 in paper copy, $1.45 in microfiche. May 12, 1972. 53 p, 2 map.

Descriptors: *Environmental effects, *Dam construction, *Kentucky, *Dams, *Flood control, Water quality control, Watershed management, Recreation, Public rights, Erosion, Reservoirs, Permits, Administrative agencies, Project planning, Project purposes, Flood routing, Forest management, Federal project policy.
Identifiers: *Environmental Impact Statements, *Kehoe Lake, Tygarts Creek (Ky).

The construction and operation of a dam and other facilities for flood control, recreation, fish and wildlife enhancement, and water quality control purposes is analyzed. The construction would affect Kehoe Lake and Tygarts Creek in Carter and Greenup Counties, Kentucky. Construction would regulate downstream flow, convert the stream and upland areas to a lake and change land use both downstream and in the lake area. Adverse environmental effects include loss of cropland and forest land and some types of biotic habitat, disruption of persons now residing on lands to be acquired, and temporarily increased erosion and sedimentation due to construction. Tax revenues from project lands would be lost until economic activity is increased by the project. Alternatives discussed are construction of other main stem reservoirs, construction of retarding dams on minor tributaries,

construction of local flood protection projects, diversion of flood waters, evacuation of the flood plain, regulation of the flood plain, and no development at all. Comments were received, among others, from the Bureau of Sport Fisheries and Wildlife, the Environmental Protection Agency and the Kentucky Department of Parks. (Smith-Adam-Florida)
W73-11999

RICHARDSON V. SCHNEIDER (ACTION INVOLVING DISPUTE AS TO OWNERSHIP OF PENINSULA WHICH JUTTED INTO LAKE).

298 A.2d 583 (N.H. 1972).

Descriptors: *Boundary disputes, *Boundaries (Property), *New Hampshire, *Judicial decisions, Legal aspects, Land tenure, Riparian land, Adjacent land owners, Adverse possession, Prescriptive rights.

Plaintiff landowner sued defendant adjacent landowner to determine the ownership of a peninsula which jutted into a lake bounding the landowner's property. The appeals court held that the evidence revealed the lower court's finding to be erroneous and remanded the case. The appellate court found that the boundary line between the plaintiff's and defendant's property hit the shore of the lake on the defendant's side of the peninsula and that as a result the peninsula, except for a small piece of land, belonged to the plaintiff. However, the court also found that the evidence supported the finding that the defendant, whose family had built and occupied a camp on the peninsula, had gained title to this land through adverse possession. The case was remanded for a further hearing as to the exact extent of the defendant's ownership of land through adverse possession. (Mockler-Florida)
W73-12000

MCMULLEN V. RAMSEY STOCK FARMS, INC. (LANDOWNERS RIGHT TO DRAIN BOTTOMLANDS OR NON-NAVIGABLE LAKE).
272 So.2d 844 (Fla. App. Ct. 1973).

Descriptors: *Reasonable use, *Florida, *Drainage, *Water control, *Water rights, Water law, Water policy, Judicial decisions, Legal aspects, Canals, Dikes, Ditches, Drainage engineering, Drainage systems, Recreation, Beds, Dry beds, Lake beds, Riparian rights, Wetlands.

Plaintiff landowners sought to restrain defendant landowner from ditching, diking and draining operations on a portion of an area known as Lake Levy. Levy Lake is not navigable; in fact, some evidence indicates that it is not actually a lake. The defendants were constructing the dikes and canals on their bottom lands in order to bring them under effective water control, and to use the controlled land to graze cattle. The plaintiffs use the lands mostly for hunting and fishing. The appellate court affirmed the trial court's decision for defendants and held that the actions of the defendants were not causing water to be drained from area bottom lands owned by the plaintiffs. In view of the fact that the actions of defendants were necessary for proper development of their lands and constituted a reasonable use of such lands, the diking and ditching operations were held not to unreasonably interfere with plaintiffs' rights. Plaintiffs had to go upon defendants' lands to reach any open waters anyway. (Glickman-Florida)
W73-12001

SOIL CONSERVATION.
Ark. Stat. Ann. secs. 9-901 thru 9-938 (Supp. 1971).

Descriptors: *Arkansas, *Erosion control, *Soil conservation, *Legislation, *Sediment control, Conservation, Erosion, Floods, Water resources development, Land use, Dams, Watershed management, Administration, Flood control, Land management, Administrative agencies.

In order to control and prevent soil erosion and floodwater and sediment damages, and to further the conservation, development, and utilization of soil and water resources and the disposal of water, it is necessary that land use practices contributing to soil wastage and soil erosion be discouraged and discontinued. Among the works of improvement and procedures needed are engineering operations such as the construction of terraces, terrace outlets, check dams, desilting basins, floodwater retarding structures, channel improvements, floodways, dikes, ponds, ditches, and the like. Provisions for the creation of soil conservation districts and plans, their governing bodies, adoption of improvement plans, and the mechanics of preliminary surveys are included. Moreover, guidelines for the levy and assessment of taxes, borrowing money, and security bonds are also provided for. All improvement plans shall be approved by and recorded with the appropriate county court. (Mockler-Florida)
W73-12002

WATER AND AIR POLLUTION CONTROL ACT.
Ark. Stat. Ann. secs. 82-1901 thru 82-1991 (Supp. 1971).

Descriptors: *Arkansas, *Legislation, *Water resources development, *Water pollution control, Environmental protection, Water quality control, Air pollution, Sewage disposal, Industrial waste, Public health, Water policy, Water management (Applied), Administrative agencies, Regulation, Comprehensive planning, Legal aspects, Legal review, Governmental interrelations, Ecology, Environmental effects, Financing.
Identifiers: *Air pollution control, Administrative regulations, Nuisance (Legal aspects).

In an effort to preserve and protect the quality of the Arkansas environment the Arkansas Water and Air Pollution Control Act was created to correct inadequate state control and regulation. The statutes cover the establishment of the Pollution Control Commission and its powers and duties, procedures for hearings and appeals, criminal penalties for various violations, operation of disposal systems, cooperation among agencies and political subdivisions, public nuisance, permit procedures with reference to disposal systems, authorization to make grants, and application procedures to receive grants. Also covered are revenue bonds, indenture provisions, maximum interest rates, execution of bonds, sources of repayment, tax exemptions, legal investments, disposition of bond sale proceeds, revenue bond redemption, and accelerated project funding . The statutes spell out the state's policy on air pollution and provide a framework for implementing the state's water and air pollution policies. The stated legislative intent indicates that the pollution of the waters in Arkansas from sewage, industrial waste, garbage, municipal refuse, and many other sources has created and is creating a hazard and danger to the public health of the people of Arkansas and that an emergency exists with reference to this problem. (Mockler-Florida)
W73-12003

LEGAL PROBLEMS IN REGULATING FLOOD HAZARD AREAS,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06F.
W73-12004

SURVEYS REQUIRED TO DESIGN NONSTRUCTURAL MEASURES,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 06F.
W73-12005

STATE WATER RIGHTS LAWS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
W. R. Walker.
Preprint No. 1908, American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 12 p. Price: $0.50.

Descriptors: *Water rights, *Water allocation, *Prior appropriation, *Water law, Competing uses, Appropriation, Beneficial use, Legal aspects.
Identifiers: *Committee on Water Laws (ASCE).

The Committee on Water Laws of the Irrigation and Drainage Division of the American Society of Civil Engineers has suggested that states declare a water use policy. The Committee has developed a general statement for a recommended policy for adoption by the states. This policy declares that all water in its natural environment is part of the public wealth and that it is a natural resource subject to appropriation. Implicit in this statement is the declaration that the appropriation doctrine, as applied in the western United States, should be adopted by all states. This doctrine recognizes three distinct elements--diversion, reasonable beneficial use, and private property. This publication questions the desirability of accepting western water right appropriation doctrines universally and, to some extent, the desirability of the continued application of this doctrine in the West. For example, under present appropriation laws, the use of water for maintaining low streamflows to protect fish life and provide recreation was found not to be a valid appropriation because an actual diversion was not necessary. Many other problems exist in deciding the best possible beneficial use of desired diversions and in the length of time the appropriations are granted. (Poertner)
W73-12007

JUDICIAL-ORIENTED INSTITUTIONAL SOLUTIONS: SAN GABRIEL VALLEY EXPERIENCE,
Clayson, Stark, Rothrock and Mann, Corona, Calif.
For primary bibliographic entry see Field 04B.
W73-12009

MISSOURI WATER QUALITY STANDARDS SUMMARY.
Missouri Clean Water Commission, Jefferson City.
For primary bibliographic entry see Field 05G.
W73-12034

FLOOD PLAIN REPORT - CITY OF SOUTHFIELD.
Southfield City Administrator's Office, Mich.
For primary bibliographic entry see Field 04A.
W73-12045

NATIONAL LAND USE POLICY: OBJECTIVES, COMPONENTS, IMPLEMENTATION.

Proceedings of a special conference sponsored by the Soil Conservation Society of America, November 27-29, 1972, Des Moines, Iowa. Soil Conservation Society of America, Ankeny, Iowa, 1973. 220 p, 4 fig, 9 tab, 56 ref. Price: $3.50.

Descriptors: *Land use, *Water resources, Urban land use, Planning, Environmental effects, Natural resources, Institutions.
Identifiers: Land use policy.

Important current issues and problems concerning a national land use policy are discussed by 18 public officials and experts on land use. The articles fall under four categories: (1) the need for a national land use policy and the objectives involved; (2) the components of a land use policy, including natural resources, human considera-

tions, water resources, economics, and transportation; (3) the implementation of land use policies and plans; and (4) some thoughts about the future, including the emerging role of the States. With respect to water-related aspects of land use policy emphasis is placed on the growing interface between water resource planning and land use. For example, although water resource development has dealt effectively with floods and drought more emphasis is required on problems related to land use such as water quality, fish and wildlife habitat, sedimentation and erosion, recreation, and ecological balance. This is particularly true in urban areas where land uses are subject to quick and extensive changes. (Elfers-North Carolina)
W73-12048

(A BILL TO BE ENTITLED: THE OIL POLLUTION COMPENSATION ACT OF 1973).

Senate Bill no 841, 93d cong, 1st Sess (February 8, 1973). 35 p.

Descriptors: *United States, *Liability, *Legislation, *Oil pollution, International law, Ships, Legal aspects, Water quality standards, Oil spills, Oil wastes, International waters, Oil, Water pollution sources, Damages, International commissions.
Identifiers: *Absolute liability.

The Oil Pollution Compensation Act of 1973 would implement the International Convention on Civil Liability for Oil Pollution Damage and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage. The bill provides that the owner of a ship at the time of the incident, or where the incident consists of a series of occurrences, at the time of the first such occurrence, shall be liable for any pollution damage caused as a result of the incident. Moreover, it provides that it applies exclusively to pollution damage (other than preventive measures) caused on the territory, including the territorial sea, of the United States or of any foreign country which is party to the Liability Convention, and to preventive measures, wherever taken, to prevent or minimize such damage. The owner shall not be liable for pollution damages if he proves that the damage resulted from an act of war, hostilities, civil war or insurrection, was wholly caused by an act or omission done with intent to cause damage by a third party or was wholly caused by the negligence or wrongful act of any government or other authority responsible for the maintenance of various navigational aids. (Mockler-Florida)
W73-12191

THE TECHNOLOGY OF SOLID WASTE MANAGEMENT--IMPLICATIONS FOR STATE POLICY.
California Assembly General Research Committee, Sacramento. Assembly Science and Technology Advisory Council.
For primary bibliographic entry see Field 05G.
W73-12193

REGULATION RELATING TO MONITORING AND REPORTING WASTEWATER DISCHARGES AND THEIR EFFECT UPON RECEIVING WATERS.
North Carolina Dept. of Natural and Economic Resources, Raleigh.
For primary bibliographic entry see Field 05G.
W73-12194

OZARK INDUSTRIES, INC. V. STUBBS TRANSPORTS, INC. (ACTION TO RECOVER FISH-KILL DAMAGES WHEN GASOLINE FROM OVERTURNED TRUCK FOUND ITS WAY INTO SPRINGFED TROUT POOL).

351 F. Supp. 351-364 (W.D. Ark. 1972).

Descriptors: *Arkansas, *Judicial decisions, *Negligence, *Groundwater movement, Trout, Legal aspects, Gasoline, Fuels, Water quality, Underground streams, Damages, Water pollution sources, Accidents, Fish farming.
Identifiers: *Strict liability.

Plaintiff trout farm operator sued to recover from the defendants gasoline truck driver and his employer for the loss of approximately 70,000 fish, allegedly killed when gasoline spilled from the truck following a traffic accident, percolated into a groundwater stream and flowed almost three miles into plaintiff's trout pool. The court initially determined that under Arkansas law, theory of strict liability was inapplicable to a right of recovery for death of fish from alleged contamination of trout pools when the gasoline and fuel oil were carried for such a long distance by subterranean waters and into the springfed trout pools. The court added that it was not a foreseeable consequence of the accident that the gasoline would percolate into subterranean waters and be carried into plaintiff's pond. As a result, the Federal District Court held that even if the driver was negligent, neither the driver nor his employer were liable for the death of plaintiff's fish. (Mockler-Florida)
W73-12197

REPORT ON PUBLIC HEARINGS ON THE ADOPTION OF PROPOSED REGULATIONS FOR THE PURPOSE OF IMPLEMENTING THE WATER AND AIR QUALITY REPORTING ACT OF 1971.
North Carolina Dept. of Natural and Economic Resources, Raleigh.
For primary bibliographic entry see Field 05G.
W73-12198

A BILL TO ASSURE THE PUBLIC IS PROVIDED WITH AN ADEQUATE QUANTITY OF SAFE DRINKING WATER.

Senate Bill 433, 93rd Cong, 1st Sess, (1973). 33 p.

Descriptors: *United States, *Potable water, *Legislation, *Water quality standards, *Public health, Water policy, Water sources, Standards, Water pollution sources, Law enforcement, Water purification, Water treatment, Federal government, Domestic water, Water quality, Water supply.
Identifiers: *Safe Drinking Water Act of 1973.

S.433, the Safe Drinking Water Act of 1973, would assure that the public is provided with an adequate quantity of safe drinking water by issuing proposed regulations prescribing national primary and secondary drinking water standards. These standards are to be such that the attainment and maintenance of them are requisite to reasonably protect the public health. The addition of any substance other than for the purpose of treating contaminants is proscribed by the bill. These standards shall prescribe the maximum permissible levels for any contaminants which may exist in any public water system in the U.S. which may cause or transmit disease, chemical poisoning, or other impairments to man. Moreover, they may apply to any feature of the water supply system, including the treatment, storage, and distribution facilities. In addition, the standards shall include requirements for the adequate operation, maintenance, surveillance, and monitoring of water quality adequate to assure a dependable supply of drinking water. Also included are requirements for construction and site selection of public water system facilities so as to protect them from floods and other natural disasters. (Mockler-Florida)
W73-12199

FELTON V. HODGES (STATE'S AUTHORITY TO REGULATE COMMERCIAL FISHING BEYOND ITS TERRITORIAL WATERS).

374 F.2d 337-340 (5th Cir. 1967).

Descriptors: *Florida, *State jurisdiction, *Fish management, *Commercial fishing, *International waters, Fishing, Saline water fish, Judicial decisions, Jurisdiction, Governmental interrelations, Fish conservation, Constitutional law, Shellfish, Legislation, Commercial shellfish, Law enforcement.

Appellant's activities in violation of the state commercial salt water fishing laws resulted in his arrest and the confiscation of his equipment. The fishing may have been done outside the seaward boundary of the state's jurisdiction; appellant argued that state jurisdiction was improperly extended. Appellant maintained that any attempt whatsoever by the State of Florida to regulate his fishing outside its territorial boundaries was violative of his constitutional rights. The Fifth Circuit Court of Appeals found that Florida had sought by legislative enactment to extend the jurisdiction of its conservation officials to activities that occurred outside state territorial boundaries. The court held that such extension was constitutional because appellant was a citizen of the state which issued the law. A state with the requisite interest, and Florida had such an interest in crawfish which moved in and out of territorial waters, may subject its citizens to extra-territorial regulation in order to protect that interest. (Smith-Adam)
W73-12200

DISCHARGE OF UNTREATED WASTES INTO THE MISSISSIPPI RIVER.
La. Rev. State. sec. 56:1464.2 thru 56:1464.4 (Supp. 1973).

Descriptors: *Water pollution control, *Waste treatment, *Louisiana, *Legislation, Water pollution (Abatement), Waste disposal, Wastes, Regulation, Penalties (Legal), Disposal, Pollution abatement, Legal aspects, Legal review, Mississippi River, Water management (Applied), Water quality control, Water utilization, Water pollution sources, Water conservation, Water law.
Identifiers: *Civil liability, *Damages (Legal), Injunctions (Prohibitory).

This chapter provides for legal penalties against persons who willfully and intentionally discharge or cause to be discharged any untreated wastes into any body of public water in the state after December 31, 1972, with provisions for extention if reasonable progress is shown. Liability does not apply to the discharge of salt water or wastes produced in the course of operations for the exploration for or production of, oil, gas or other minerals. The provisions do not apply to any unintentional pollution or contamination resulting from or in connection with the production of agricultural products. Whenever, upon the sworn complaint of any person, it is made to appear that a violation has occurred or may be occurring, the District Court will order a hearing. A copy of the order will be served on the violator. If the court finds a violation has occurred or is occurring, it may assess a civil penalty not to exceed $10,000 for each day during which the violation has occurred and all costs of the hearing. If a violation is found to be continuing, the court may issue an injunction. The complainant must file a $100 bond to cover the hearing cost if the court finds no violation. No liability shall be incurred by complainant due to such filing of a complaint. (Napolitano-Florida)
W73-12204

SAFE DRINKING WATER.
For primary bibliographic entry see Field 05G.
W73-12205

PROPOSED FLORIDA FRONTIER RIVERS NATIONAL CULTURAL PARK.

Hearing--Subcomm. on National Parks and Recreation--Comm. on Interior and Insular Af-

fairs, U.S. House of Representatives, 92d Cong, 2d Sess, March 28, 1972. 45 p.

Descriptors: *National parks, *Florida, *Legislation, *Estuaries, Parks, Recreation facilities, National historic parks, Land use, Natural resources, Scenery, Conservation Aesthetics, Eminent domain, Preservation.
Identifiers: *Congressional hearings.

H.R. 586 would authorize the establishment of the Florida Frontier Rivers National Cultural Park. The purpose is to preserve the Nassau River estuary and associated cultural and historic sites and buildings of northeastern Florida so as to encourage public understanding and appreciation of the heritage fashioned by the past and present interaction of man with this environment. The three estuarine rivers of northeastern Florida unify a nationally significant cultural heritage and, in addition, posses important scenic, natural, ecological, scientific, and other values contributing to public enjoyment and scientific study. The proposed legislation also provides for the designation of additional sites of non-federal ownership for incorporation within the proposed park. The park would comprise 85,000 acres of lands and waters with ownership divided between the federal, state, and local governments. Nearly all of the testimony offered favored passage of the bill. (Mockler-Florida)
W73-12206

DESIGNATING ROCK CREEK IN MONTANA AS PART OF THE WILD AND SCENIC RIVERS SYSTEM.

Hearing--Subcomm. on Public Lands--Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, August 29, 1972. 60 p.

Descriptors: *Montana, *Legislation, *River systems, *Wild River Act, Rivers, Fishing, Conservation, Natural resources, Preservation, Legal aspects, National recreation areas, Planning, Water law.
Identifiers: *National Wild and Scenic River System, *Congressional Hearings, *Rock Creek, Mont.

S. 2132 would amend the Wild and Scenic Rivers Act so as to designate Rock Creek in Montana as a component of the national wild and scenic rivers system. The subcommittee heard statements by interested individuals and representatives of concerned organizations. Representatives of various state agencies and a state senator also made their views known to the subcommittee. Rock Creek gained a reputation as an outstanding sport fishing stream. As a result many dwellings have been built along its banks; these dwellings now represent a major pollution threat. Furthermore, this development is ruining the aesthetic quality of the river. For this reason some feel strongly that the river should be preserved in its natural state. On the other hand, a representative of the Missoula, Montana Chamber of Commerce expressed the opinion that further action on the bill be deferred until a current U.S. Forest Service study of the creek is completed. (Reed-Florida)
W73-12207

UNION DRAINAGE DIST. NO. 1 V. SPECIAL DRAINAGE DIST. (ACTION BY DRAINAGE DISTRICT TO IMPOSE LIABILITY ON ADJOINING DRAINAGE DISTRICTS TO BEAR SHARE OF COST OF CLEAN-OUT WORK ON DITCHES IN THE DISTRICT).

295 N.E.2d 91-96 (2d D.C.A. Ill. 1973).

Descriptors: *Illinois, *Drainage programs, *Judicial decisions, *Drainage districts, Legal aspects, Jurisdiction, Drainage systems, Ditches, Water management (Applied), Flow control, Cost sharing.

Plaintiff drainage district sued to have defendants adjoining drainage districts bear a just proportion of the costs of a projected clean-out work on ditches in the plaintiff district. The Illinois Appellate Court held that the adjoining districts had presented sufficient evidence to show that they would receive no benefits from the projected work and that therefore they were incorrectly assessed. This was so despite the fact all three districts involved were located in the same watershed and all of the water from the adjoining districts' ditches emptied into and through the plaintiff district's ditch. The court emphasized that in order to be assessed for a drainage project, the lands must be rendered more productive, more accessible, or the market value substantially increased and their actual or intrinsic value enhanced. The mere fact that the flow of water has or will be accelerated is not of sufficient benefit to justify an assessment for a drainage project. (Mockler-Florida)
W73-12208

CITIZENS FOR CLEAN AIR, INC. V. CORPS OF ENGINEERS, U.S. ARMY (PUBLIC HEARING NOT REQUIRED UNDER THE NEPA).
356 F. Supp. 14-21 (S.D. N.Y. 1973).

Descriptors: *United States, *Legal review, *Administrative decisions, *Judicial decisions, *Environmental effects, Waste water (Pollution), New York, Water pollution, Water quality, Waste water disposal, Legal aspects, Permits, Project planning, Water quality, Adjudication procedure, Hydroelectric plants, Administrative agencies, Legislation, Federal Water Pollution Control Act.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statements.

Plaintiffs private citizens moved for an order enjoining the defendant utility company from proceeding with the construction of a water intake and discharge facility, and to enjoin the defendant Army Corps of Engineers from issuing any permit in connection therewith. Plaintiffs contended that the Corps' refusal to hold a public hearing on the environmental impact statement being prepared as a precondition to issuance of the permit was in violation of the National Environmental Policy Act (NEPA) and of due process at law. The United States District Court for the Southern District of New York held that NEPA does not require the holding of a public hearing, and that even if the Corps' regulations required such a hearing, it is not required to be held before the impact statement is completed. The Court therefore dismissed plaintiff's motion. (Reed-Florida)
W73-12209

EXPLOITATION OF SEABED MINERAL RESOURCES--CHAOS OR LEGAL ORDER,
J. Dombroski.
Cornell Law Review, Vol 58, No 3, p 575-601, March 1973. 149 ref.

Descriptors: *Beds under water, *Mineral industry, *Oceans, *International law, Continental shelf, Legal aspects, Exploitation, Governments, United Nations, Jurisdiction, Mining, Exploration, Beds, Law of the sea, Treaties, International commissions, International waters.

The need for new order in the international seabed becomes increasingly intense as technology continues to march seaward. A new legal order in the seabed must provide for a system which guarantees mutual recognition of and non-interference with various extractive activities and which provides mechanisms for the peaceful settlement of disputes. Present defects in the international framework are pointed out; the exploitability criterion of the Geneva Convention is both indeterminate and outmoded as a limit on national jurisdiction. As an example, the United States has already issued exploration permits for areas of the sea lying 300 miles from the coast and at depths ranging up to 1,525 meters. Existing seabed controls may lead to creeping jurisdiction, not only outward from the coast, but also vertically through the water column. The fear exists that the lack of legal order in the seabed will slowly erode the area of high seas as nations claim greater preferential rights. Further, unregulated national exploitation of the seabed may lead to new levels of international strife and conflict. (Mockler-Florida)
W73-12210

ENVIRONMENTAL LAW--EXPANDING THE DEFINITION OF PUBLIC TRUST USES,
M. Smythe.
North Carolina Law Review, Vol 51, No 2, p 316-325, December 1972. 54 ref.

Descriptors: Easements, *Judicial decisions, *Public rights, *Flood plain zoning, Wetlands, Legal aspects, Constitutional law, Coastal marshes, Land use, California, New Jersey, Wisconsin, Land development, Water rights, Legislation, State governments, Intertidal areas.
Identifiers: *Public trust doctrine, Coastal zone management, Inverse condemnation.

One problem faced by legislatures when attempting to control the use of coastal wetlands is that by attempting too much regulation they may encroach upon property owners' rights protected by the fifth amendment's prohibition against taking property without just compensation. A recent case in California held that an individual's ownership of tidelands is burdened with a public trust easement. Thus, the landowner was prohibited from constructing a marina on his tidelands. This case provides one means of avoiding inverse condemnation problems in regulating wetlands. New Jersey joined California in expanding the public trust doctrine when its Supreme Court decided that the public trust doctrine prohibited municipalities from charging higher rates to non-residents than to residents attempting to use the city's beaches. Plaintiffs had not argued the public trust as a theory of recovery; however, the court supplied the rationale on its own. There is room for abuse if the government carries the public trust doctrine too far; thus, there must be limits to the type of use the government wishes to make of its easement. Fairness dictates that this doctrine should only be used as a stopgap approach to the prevention of wetlands destruction. (Mockler-Florida)
W73-12211

OIL AND GAS--RIGHTS OF MINERAL LESSEE IN USE OF SURFACE OWNER'S FRESH WATER FOR SECONDARY RECOVERY PURPOSES, SUN OIL V. WHITAKER.

Land and Water Law Review, Vol 8, No 1, p 175-183, 1973. 38 ref.

Descriptors: *Leases, *Easements, *Competing uses, *Water rights, *Texas, Judicial decisions, Mineral industry, Legal aspects, Exploitation, Groundwater mining, Groundwater resources, Wells, Irrigation.

A decision is analyzed of the Texas Supreme Court dealing with the rights of a mineral lessee to use the surface owner's fresh water for secondary recovery purposes. This case is apparently the first state decision granting the lessee as the owner of the dominant estate an implied easement to use fresh water resources owned by the surface estate landowner in such manner that the surface estate landowner would be substantially and irreparably injured. The mineral estate is dominant because the lessee's rights to use the surface estate are superior to those retained by the lessor insofar as necessary to the full enjoyment of the mineral grant. A previous case had limited this relationship by saying that the mineral lessee cannot make unreasonable use of the surface estate. In the absence of a showing of adequate consideration paid by the mineral lessee for his substantial taking

of the surface estate, the courts should not attempt to transfer a valuable property interest without clear evidence that this was the intent of the parties. (Mockler-Florida)
W73-12212

CIVIL LIABILITY FOR OIL POLLUTION,
For primary bibliographic entry see Field 05G.
W73-12213

THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972: EFFECTIVE CONTROLS AT LAST,
For primary bibliographic entry see Field 05G.
W73-12214

DRAINAGE LAW IN NORTH DAKOTA: AN OVERVIEW,
North Dakota Univ., Grand Forks. School of Law.
R. E. Beck, and B. E. Bohlman.
North Dakota Law Review, Vol 47, No 4, p 471-513, Summer 1971. 255 ref.

Descriptors: *North Dakota, *Drainage, *Drainage practices, *Surface drainage, *Drainage districts, Legal aspects, Governments, Drainage systems, Farm management, Surface runoff, Water control, Drainage programs, Adjudication procedure, Administrative agencies, Common law, Judicial decisions, Reasonable use, Watershed Protect, and Flood Prev. Act, Legislation, Natural flow doctrine.
Identifiers: Common enemy rule.

This comprehensive analysis of drainage law in North Dakota surveys the substantive common law and institutional law as it now exists in North Dakota in relation to drainage, and attempts to indicate some of the gaps that exist. The institutional law discussion focuses on Drain Board projects and recognizes that other local authorities may also sponsor drainage projects. It does not explore in any depth the role of the State Water Commission in drainage. The judicial decisions rendered on drainage are not entirely reliable since the applicable statutory provisions have been subsequently revised in scope and meaning. Drainage in North Dakota is characterized by a misconception as to the value of drainage installation so far as agricultural lands are concerned because in many instances, the assumed benefits never materialized. The flexible common law and the institutional approach work hand in hand. The institution can frequently act as mediator between differing parties without having to assert its drainage powers. (Mockler-Florida)
W73-12215

WATER POLLUTION CONTROL.

Congressional Record, Vol 119, No 9, p 1016-1018 (daily ed.) January 18, 1973.

Descriptors: *Federal Water Pollution Control Act, *Agriculture, *Pollution abatement, *Legislation, *Water pollution control, Legal aspects, Industrial wastes, Liquid wastes, Waste disposal, Waste water disposal, Water pollution, Water reuse, Waste treatment, Permits, Grants, Treatment facilities, Water quality standards, Water pollution sources.
Identifiers: Environmental Protection Agency.

Introduced into the Congressional Record was an article by the President of American Agribusiness Associates commending federal attempts at pollution control, particularly the 1972 Federal Water Pollution Control Act (FWCA). Modern agriculture was challenged to aid in assuring a quality environment. Agriculture contributes more waste than mineral, industrial or residential sources; the problem is accentuated by the wastes resulting from modern efficient agricultural techniques. The 1972 FWPCA is particularly important in that it gives the Environmental Protection Agency authority to require firms discharging pollutants into waters to meet water quality standards, and to preempt state minimum effluent levels with more effective guidelines established by the EPA. The FWPCA is discussed in relationship to its effect on agricultural industries such as poultry slaughtering plants. (Glickman-Florida)
W73-12216

LOUISIANA COASTAL COMMISSION.

La. Rev. Stat. secs. 34:2251 thru 34:2253.1 (Supp. 1973).

Descriptors: *Louisiana, *Legislation, *Water management (Applied), *Multiple purpose projects, *Coastal plains, Coastal marshes, Saline water intrusion, Coastal engineering, Administrative agencies, Administrative decisions, Regulation, Project planning, Water allocation (Policy), Water policy, Water resources development, Flood control, Navigation, Freshwater, Water pollution control, Water yield improvement, Wildlife conservation, Drainage, Environmental effects.
Identifiers: *Administrative regulations, *Coastal zone management.

The Louisiana Coastal Commission, (Commission), is established as a political subdivision of the state and body corporate. The Commission replaces the abolished Louisiana intracoastal Seaway Commission. The Commission is to be administered by a Board of Commissioners, (Board), with provisions set forth as to membership on the Board and their authority to establish rules necessary to regulate the Commission. The Commission is empowered to plan, establish, construct, own, operate, and maintain: (1) a system of navigation channels to improve navigation conditions for water traffic; (2) structures necessary to preserve and increase fresh water supply; (3) structures to provide fresh water systems and wildlife habitat; (4) structures to prevent salt water intrusion from the Gulf of Mexico; and (5) structures to improve drainage for flood control. In furtherance of these goals, the Commission is authorized to levy taxes to finance projects. The area of the Commission's jurisdiction is limited to specific parishes along the Louisiana coast. (Dunham-Florida)
W73-12217

SAVE OUR TEN ACRES V. KREGER (STANDARD OF JUDICIAL REVIEW OF AGENCY ACTION UNDER NEPA).

472 F.2d 463-468 (5th Cir. 1973).

Descriptors: *United States, *Legal review, *Administrative decisions, *Judicial decisions, *Environmental effects, Flood plains, Ecology, Enviromental control, Air pollution, Legal aspects, Flood plain zoning, Construction, Legislation, Administrative agencies.
Identifiers: National Environmental Policy Act, Environmental Impact Statements.

Plaintiff appellant was a voluntary unincorporated association which sought to enjoin the construction of a federal office building. Appellant contended that the General Service Administration (GSA) failed to comply with the National Environmental Policy Act when it failed to file an environmental impact statement regarding the site selection for the office building. Appellant also contended that construction of the building would aggravate a substantial air pollution problem and would be improperly located in a flood plain. Appellee answered that there was no need to file a statement because the construction would not significantly affect the quality of the human environment. The trial court had refused to grant relief, holding that the decision of the GSA to not file an impact statement could not be overturned unless it was found to be arbitrary, capricious or an abuse of discretion. The Fifth Circuit Court, while not going to the merits of the claim, reversed and remanded directing that the more relaxed standard of reasonableness rather than arbitrary or capricious be used by the court in reviewing the decision of the GSA to not file an impact statement. (Glickman-Florida)
W73-12218

CONSCIOUSNESS OF STREAMS: THE 1971 ALABAMA WATER POLLUTION CONTROL ACT.

Alabama Law Review, Vol 24, No 3, p 737-776, Summer 1972. 40 p, 251 ref.

Descriptors: *Alabama, *Administrative agencies, *Water pollution sources, *Legislation, *Water pollution control, Industrial wastes, Legal aspects, Water quality control, Tennessee Valley Authority, Sewage effluents, Waste disposal, Federal Water Pollution Control Act, Penalties (Legal), Law enforcement, Adjudication procedure, Mine wastes, Agricultural runoff, Thermal pollution, Water quality standards, Governments.
Identifiers: *Alabama Water Pollution Control Act, Administrative regulations.

The 1971 Alabama Water Pollution Control Act created a Water Improvement Commission. Unlike a previous commission, members of the new Commission may not be connected with industry. Those 'persons' subject to restrictions of the Act include individuals, public corporations, any form of business and municipal corporations; it does not include the federal government, the state, counties and probably the Tennessee Valley Authority. All waters of the state, whether non-navigable or navigable, underground or surface, are covered by the Act. A definition of pollution is included in the Act, however, the Commission may by regulation amplify or restrict the definition. Provision for penalties are also discussed. The major sources of water pollution in Alabama are: strip mining, animal manure, thermal pollution, radiation, vessels, sewage and industrial wastes. The effectiveness of the Act depends upon the promulgation of adequate regulations by the Commission for such things as effluent limitations and water quality standards. The legislature has attempted to create an unbiased commission and has given it adequate legal powers and discretionary authority to fill the interstices of the statute. (Mockler-Florida)
W73-12219

DAMS AND SPILLWAYS (HEARINGS AND APPEAL).

Iowa Code Ann. secs. 112.3 thru 112.8 (Supp. 1973).

Descriptors: *Iowa, *Dams, *Legislation, *Administrative agencies, *Legal review, Water policy, Legal aspects, Spillways, Compensation, Compensatory payment, Cost repayment, Dam construction, Structures, Administrative decisions, Water management (Applied), Project planning, State governments.
Identifiers: *Administrative hearings.

After the Commission approves a dam or spillway project it shall set a hearing date and publish notice of the hearing in a newspaper of general circulation for a specified time period. Any claim for damages resulting from the project shall be filed with the Commission at or before the hearing. The Commission shall examine each claim and determine the amount of damages and compensation due each claimant. After such action, the Commission may proceed with the project or dismiss the entire proceedings. Any appeals from decisions of the Commission shall be treated as ordinary proceedings. All other appeals shall be triable in equity. Appeals must be taken within 20 days of

final action or order of the Commission by filing notice with the secretary of the Commission. This notice must be accompanied by an appeal bond conditioned to pay all costs adjudged against the appellant. (Glickman-Florida)
W73-12220

WATERCOURSES--CANALS--TOLL BRIDGES,

Ind. Ann. Stat. secs. 26-1413 thru 26-1417 (1970).

Descriptors: *Indiana, *Legislation, *Canals, *Channel improvement, Navigation, Flow, Conveyance structures, Transportation, Local governments, Canal construction, Repairing, Streams, Bridges, Channels, Administration, Economics, Planning, Financing, Open channels, Legal review.
Identifiers: *Canal repair, *Toll bridges, Navigation obstructions.

It is unlawful for the Board of Commissioners, (Commissioners), of any county in Indiana in, through, along, or by which passes any canal, which is now used for the purpose of navigation, to appropriate out of the county treasury any amount of money not exceeding $10,000, to aid in putting or keeping in repair any such canal for the purposes of navigation. The Commissioners may purchase any toll bridge or buy any private interest therein. A provision is also made in the statute for the straightening or clearing of channels of non-navigable streams by the couty commissioners upon a petition of 51% of landowners whose frontage lies between any two public bridges or other points designated in the petition. (Reed-Florida)
W73-12221

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS.

Ind Ann Stat secs 27-243 thru 27-250 (1970).

Descriptors: *Indiana, *Legislation, *Drainage districts, *Drainage programs, Water management (Applied), Land management, Flood control, Financing, Repairing, Maintenance, Drainage, Drainage systems, Drains, Ditches, Legal aspects, Project planning, Regulation, Legal review, Administrative agencies, Administrative decisions.

In all cases where a public ditch or drain has already been or shall hereafter be constructed, a specified percentage of the owners of the real estate assessed who would benefit by the construction of such ditch or drain may file a petition in the appropriate court praying for the establishment of a Drainage Maintenance and Repair District, (District). The requirements that must be met and the procedures to be followed for the establishment of the District are specified. If the court approves the petition, it will establish a commission composed of landowners within the district to administer the District. The commission is to keep and maintain such ditches and drains in proper condition and has full power and authority to hire all such labor, purchase all such material and do all such acts as are necessary and incident thereto. Provision is made for the dissolution of the District upon the petition of a specified percentage of the landowners within the District. Affected landowners may request a hearing on establishment of a district or on projects approved by the commissioners. (Reed-Florida)
W73-12222

DRAINS AND WATERCOURSES AFFECTING HIGHWAYS.
Ind Ann Stat secs 27-407, 24-408 (1970).

Descriptors: *Indiana, *Legislation, *Flow control, *Water control, *Road construction, Channel improvement, Highways, Embankments, Highway effects, Flow, Drains, Ditches, Streams, Bridges, Drainage systems, Administration, Planning, Governmental interrelations, Project planning, Rights-of-way, Erosion control, Slope stability.

The governing bodies or agencies of the state of Indiana charged with the duties of the construction, maintenance and repair of public highways shall have the power to change the course of any stream, watercourse or drainage ditch, or to restore to its original or former channel any stream, watercourse or drainage ditch in case it has wandered from its original or former course. Such bodies or agencies may also do such construction work as may be necessary to protect the banks or slopes of any such stream, watercourse or ditch in the event that the waters of any such stream, watercourse or ditch are causing or threatening injury to any public highway or bridge. If the proposed work of any such state agency conflicts with the jurisdiction of a federal agency, the consent or waiver of such federal agency shall be procured before the beginning of the proposed work. The means of accomplishing the purposes of this act by the proper agency, the procedure therefor, and the method of paying the costs thereof are provided for in the statute. (Reed-Florida)
W73-12223

PROTECTION OF LAKES.
Ind Ann Stat secs 27-601 thru 27-659 (1970).

Descriptors: *Indiana, *Legislation, *Water levels, Lakes, Drainage programs, Drainage systems, Freshwater, Administrative agencies, Dams, Levees, Drainage, Drainage area, Ditches, Drainage districts, Drains, Legal aspects, Administration, Planning, Permits, Water law, Economics, Project planning, Assessments, Legal review.
Identifiers: *Freshwater lakes.

It is unlawful to establish, order or construct any ditch or drain cutting into, through or upon the line of any freshwater lake or to in any way construct a ditch or drain having a bottom depth lower than the level of the lake as established by law. This act applies to all drainage projects that are to be constructed, whether they are in the nature of alterations, changes or other improvements, as well as to the construction of new ditches and drains. It is unlawful to interfere with any dam, bank or levee or to lower the water level, with certain exceptions, of any artificial lake. It is unlawful to construct or repair any ditch or drain having a specified bottom depth without first having received the permission of the Indiana Department of Conservation, (Department). The Department is authorized to establish the average water levels for all lakes and to construct, sponsor and supervise all works necessary to maintain that level. The act makes provision for the procedures necessary for the Department to fulfill these functions including legal review of project plans and liability for violations of the act. (Reed-Florida)
W73-12224

LEVEES.

Ind Ann Stat secs 27-806 thru 27-818 (1970).

Descriptors: *Indiana, *Legislation, *Levees, *Flood control, Regulation, Encroachment, Levee districts, Safety, Streams, Water control, Barriers, Flood protection, Condemnation, Legal aspects, Administration, Land use, Water management (Applied), Administrative agencies, Financing, Project planning, Legal review, Water distribution (Applied).
Identifiers: Fences.

The committee placed in the charge and control of a levee has full power and authority to make all necessary repairs in order to keep and maintain the levee in its orginal condition. The committee has the power to change the line and location of a levee at any point, if it is necessary to the safety and protection of such levee. The committee has full power over a levee for the purpose of preserving and protecting such levee. The committee, when requested in writing by a majority of the owners of land protected by the levee under its charge, has the authority to protect against the encroachment of any stream, to make additions to such levee by increasing its height or width and to remove from lands protected by such levee any water that may collect or remain standing and which has no means of outlet. Provisions are included for the acquisition of real estate by condemnation. The statute also provides for the collection of assessments for the completion of proposed projects. (Reed-Florida)
W73-12225

LEVEE AUTHORITY DISTRICTS.

Ind Ann Stat secs 27-1001 thru 27-1033 (1970).

Descriptors: *Indiana, *Legislation, *Levees, *Levee districts, *Flood control, Safety, Water control, Land use, Financing, Barriers, Flood protection, Administration, Eminent domain, Right-of-way, Easements, Legal aspects, Planning, Regulation, Governmental interrelations, Legal review, Administrative agencies.

Whenever the council of a city located in a county within a specified population range adopts legislation in favor of the establishment of a Levee Authority District, (District), under the provisions of this act, for the purposes of acquiring land, rights-of-way and easements on which the Board of the District or the United States Army Corps of Engineers can construct, improve, maintain, equip, control, lease and regulate levees to hold back flood waters, such District, conterminous with the jurisdictional boundaries of the councils enacting such legislation, will be established. The composition of the board as well as its powers and duties are specified. The Board of any District is authorized to exercise the power of eminent domain and issue general obligation bonds to meet the financial needs of the Board. Specific provisions dealing with administration, regulation and financing District projects are included. (Reed-Florida)
W73-12226

GROUNDWATER CONSERVATION.
Ind Ann Stat secs 27-1301 thru 27-1316 (1970).

Descriptors: *Water supply development, *Indiana, *Legislation, *Groundwater resources, *Well regulations, Groundwater, Water pollution, Water management (Applied), Water policy, Water quality control, Groundwater availability, Groundwater mining, Water sources, Water supply, Water wells, Wells, Water conservation, Water resources, Legal aspects, Administration, Regulation, Planning, Permits, Penalties (Legal).
Identifiers: *Administrative regulations.

It is declared to be the public policy of the state of Indiana to conserve and protect its groundwater resources. The Indiana Department of Conservation, (Department), may designate certain areas where the withdrawal of groundwaters exceeds or threatens to exceed its natural replenishment as restricted use areas. In such areas, it is unlawful, except under certain circumstances, for any person or group except public utilities to withdraw or use for any purpose groundwater in excess of a specified amount per day. All well owners in restricted areas must file with the Department a complete record of all new wells drilled in the area. The Department has the authority to require waste control measures and to require owners of flowing waterwells to reduce the flow of such wells. A per-

mit must be obtained from the Department to introduce potable groundwater into any underground formations which contains nonpotable water. The Department is authorized to adopt such rules and regulations as may be necessary to determine quantities of water being removed from the ground or for administering any provisions of this act. Penalties for any violations of this act are provided. (Reed-Florida)
W73-12227

ENVIRONMENTAL POLICY.

Ind Ann Stat secs 35-3501 thru 35-5308 (Supp. 1972).

Descriptors: *Environmental control, *Water resources development, *Indiana, *Legislation, *Environmental effects, Decision-making, Planning, Public health, Water pollution control, Administrative agencies, Regulation, Comprehensive planning, Ecology, Pollution abatement, Natural resources, Standards, Social aspects, Water resources development.
Identifiers: *State policy.

The purposes are to declare a state policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and bioshere and stimulate the health and welfare of man, and to enrich the understanding of the ecological systems and natural resources important to the state of Indiana. The statutes provide that all agencies of the state shall utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision-making which may have an impact on man's environment, identify and develop methods and procedures which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making, and include in every recommendation or report on proposals for legislation and other major state actions significantly affecting the quality of the human environment a detailed statement on the environmental impact of the proposed action. All state agencies are to review present statutory authority, regulations, policies and procedures and propose changes to comply with the provisions of this chapter. (Mockler-Florida)
W73-12228

INDIVIDUAL DRAINAGE RIGHTS.

Iowa Code Ann secs 465.1 thru 465.35 (1971).

Descriptors: *Iowa, *Legal review, *Drainage systems, *Legislation, Drainage, Drainage practices, Drainage programs, controlled drainage, Drainage effects, Tile drainage, Drainage area, Water policy, Surface waters, Mine drainage, Right of way, Easement, Legal aspects, Agriculture, Flood control, Local governments, Administrative decisions, Public benefit, Damages, Outlets.
Identifiers: *Drainage rights.

When any landowner desires to construct any drainage system for agricultural or mining purposes or for securing more complete drainage across the land of another, the right of way of a railroad or a highway, he must file an application with the County Auditor. The auditor will then set a hearing date before the County Board of Supervisors (Board) and serve notice on the party whose land is to be used. Any landowner claiming damages must file his complaint with the auditor prior to the hearing. The Board shall hear the application on the merits to determine if the project is beneficial. Before constructing the drain, the applicant shall pay any damages awarded to the party through whose land the drain will be constructed. Any person who shall obstruct or damage any drain shall be liable to the owner. The Board shall also decide any disputes between adjoining landowners whose property is divided by any watercourses or natural drainage line. Specific provisions relating to hearing procedures and appeals are included. There are also provisions concerning special procedures to be followed when drainage construction affects railroad and public highway rights-of-way. (Glickman-Florida)
W73-12229

POLLUTION OF WATERS OF STATE.

Ind Admin Rules and Reg Ann secs (68-523)-1 thru (68-523)-10 (Supp. 1970).

Descriptors: *Indiana, *Water pollution control, *Water quality, *Water quality standards, Public health, Industrial wastes, Water quality control, Lake Michigan, Bacteria, Waste disposal, Turbidity, Oil, Solid wastes.
Identifiers: *Administrative regulations, Little Calumet River.

These administrative rules and regulations provide for water quality standards and criteria for Lake Michigan open water and shore water, Lake Michigan inner harbor basin, Indiana harbor canal, the Grand Calumet River, Wolf Lake, and the Little Calumet River flowing into Illinois. All waters of the state must be free from substances attributable to municipal, industrial, agricultural or other discharges that will settle to form putrescent or otherwise objectionable deposits and free from floating debris, oil, scum and other floating materials attributable to municipal, industrial, agricultural or other discharges in amounts sufficient to be unsightly or deleterious. Furthermore, all waters must be free of substances in such degree as not to create a nuisance and free from substances or other discharges in concentrations or combinations which are toxic and harmful to human, animal, plant or aquatic life. Criteria for oils, solid wastes, bacteria, BOD count and other elements are provided for each body of water. (Mockler-Florida)
W73-12230

CONSENSUS: THE FIRST STEP,
Northeastern Illinois Planning Commission, Chicago.
For primary bibliographic entry see Field 06F.
W73-12234

ANNUAL REPORT 1972.
Delaware River Basin Commission, Trenton, N.J.

1972. 29 p, 2 fig, 35 photo, 2 tab.

Descriptors: *Water resources planning, *Water quality control, *Regional development, *River basin development, *Delaware River Basin Commission, Environmental effects, Recreation, Planning, Maryland, New Jersey, New York, Delaware, River basins, *Delaware River.
Identifiers: Tocks Island, Hurricane Agnes, Schuylkill River.

The 10th Annual Report includes a summary of the first decade, reports on various on-going programs, an article on the floods that struck the river basin, particularly Hurricane Agnes, and an outline of a new unit of the Commission. The new unit is to deal exclusively with matters of environmental quality and be responsible for complying with the national Environmental Policy Act. Reports on existing programs include the water quality program to clean up the Delaware River estuary, the Tocks Island reservoir and park project and planning for the Schuylkill River sub-basin. Some of the significant areas of involvement of the Commission in the past decade include emergency authority and programs during the severe drought of the mod-1960's, cooperative policies for uniform water quality standards in the basin, the cleanup of the estuary, controls over groundwater, flood hazard mapping and information, power plant siting, and recreation. These program areas and others are carried on largely at a regional scale and are closely related to the strong urban nature and demands in the basin. (Elfers-North Carolina)
W73-12240

US-USSR EXPERTISE EXCHANGE,
W. S. Butcher.
Water Spectrum, Vol. 5, No. 1, p. 17-24, 1973.

Descriptors: *United States, *Water resources development, *Comprehensive planning, *Irrigation projects, Irrigation canals, Drainage, River systems, River training, Salinity, Water pollution, Dams.
Identifiers: Golodnaya Steppe, Kara Kum, Caspian Sea, *USSR.

Water resources has been identified as one of the needed activities between the U.S. and the U.S.S.R. While their irrigated land is less in acreage that in the U.S., the Soviets are working to increase acreage of new irrigated land. Particular reference is made to the Soviets' arid lands projects, especially those in the Golodnaya Steppe where attention is increasingly paid to problems of drainage, irrigation hardware, and automated irrigation practices; and in the Kara Kum Desert where the great water diversion canal is now 500 miles in length and will be double that when it reaches the Caspian Sea in approximately 1980. There is brief mention of the several river reversal projects, some of which are designed to restore the level of the Caspian Sea to overcome problems of increasing salinity and industrial pollution, as well as a decreasing fish harvest. The Soviet stage of water resources development is likened to U.S. recent past, except that their projects are on a larger scale. Little environmental concern is evident to date in the U.S.S.R. (Paylore-Arizona)
W73-12255

THE CHANGING DECISION RULES IN THE POLITICS OF WATER DEVELOPMENT,
Arizona Univ., Tucson.
H. Ingram.
Water Resources Bulletin, Vol 8, No 6, p 1177-1188, December 1972. 1 tab, 12 ref.

Descriptors: *Water resources development, *Political aspects, *Water policy, *Decision making, Federal government, Social impact, Environmental effects, Water resources, State governments, Evaluation, Multiple purpose projects, Economic impact, Project benefits, Projects, Financing, Budgeting, Cost-benefit ratio, Economic feasibility, Ecology.

Policy makers concerned with selecting potential water projects to be authorized and funded for construction have customarily applied a common set of decision rules to minimize the cost of decision making. These rules are identified, their operation described, and the logic behind adoption explained. The 5 decision rules are: local support, agreement, mutual accommodation, mutual noninterference, and fairness and equity. These guidelines are intended to ensure support, lessen conflict, and protect the reputation of water development as a worthwhile Federal investment. Currently, conflict has greatly increased the cost of the decision-making process to the Federal agencies which must spend the time, energy, effort, and influence to resolve differences among interest groups. Since current indications are that the traditional rules are no longer followed, an attempt has been made to identify changes in the rules. The question remains whether current revisions of decision rules will lessen the intensity of conflict. Today, Federal agencies are spending more energy to increase public participation in the

decision-making process. However, even with all the impacts displayed and points of view heard, Federal agencies doubt that a water development program of past magnitude can be recreated. (USBR)
W73-12335

6F. Nonstructural Alternatives

FLOOD AND EROSION CONTROL.
For primary bibliographic entry see Field 06E.
W73-11978

LEGAL PROBLEMS IN REGULATING FLOOD HAZARD AREAS,
National Water Commission, Arlington, Va.
E. Liebman.
Preprint No. 1869, American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 26 p, 25 ref. Price: $0.50.

Descriptors: *Flood protection, *Non-structural alternatives, *Legal aspects, *Flood plains, Flood plain zoning, Flood insurance, Levees, Floods, Floodproofing, Channel improvement, Regulation.

Flood hazard areas along rivers require both structural and nonstructural protection. Structural devices, such as dams, levees, flood proofing, and channelization are often not adequate by themselves. Nonstructural methods include items such as flood plain zoning, flood insurance and tax adjustments. The lawyer and the engineer have important complementary roles in the management of flood plains. It must be recognized that flooding is a part of the natural process, and that flood problems exist only when this flooding affects man's activities. Structural measures are no panacea for providing flood protection, since structures can be overtopped by flows larger than design flows or they can fail completely. In other cases, there might not exist an available site for protective structures, or funds may be available. Nonstructural methods of control, such as flood plain zoning, tend to balance the benefits obtained against the costs that flooding would impose on the community and the costs incurred by developers prohibited from utilizing land according to their wishes. Nonstructural measures for flood control have been enacted at all levels of government. Some measures are controversial. For example, flood plain zoning requirements may be challenged in the courts for allegedly imposing undue hardships upon riverine landowners. Courts have generally invalidated restrictions which deny all economic uses for flood prone land although severe restrictions are upheld. (Poertner)
W73-12004

SURVEYS REQUIRED TO DESIGN NONSTRUCTURAL MEASURES,
Georgia Inst. of Tech., Atlanta.
L. D. James.
Preprint No. 1881, American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 25 p. Price: $0.50.

Descriptors: *Flood protection, *Non-structured alternatives, *Attitudes, *Data collections, Social aspects, Pyschological aspects, Decision making, Motivation, Flood damage, Flood plains, Flood plain zoning, Flood control, Project planning.

Nonstructural measures for flood protection require information gathering surveys just as structural designs require surveys to gather information. The problems of nonstructural measures are more complex than the problems of structural measures since they depend on human attitudes and actions which vary from person to person and change in time. For example, while a dam may stand for 100 years or more, attitudes on flood plain zoning regulations may change soon after the last major flood is forgotten. This requires vigilance on the part of responsible officials to keep attitudes in theirproper perspective by means of continual information programs. Among individuals, attitudes toward flooding of their property may range from an intense desire to avoid flood prone areas to almost total unconcern for the problems. Surveys of the attitudes of the public to flooding can be used to form a model of how different groups will react to various alternatives to nonstructural measures of flood control. Some people, for instance, live in flood prone areas because they did not realize the flood hazard. Others felt the flood damage expected was outweighed by the advantages of the homesite. Some could be convinced to move out based on the flood hazard to themselves, while others consider the potential disruption of the area's ecology by their presence as a reason for not occuppying flood prone lands. (Poertner)
W73-12005

BALANCING ENVIRONMENTAL AND DEVELOPMENTAL VALUES,
National Water Commission, Arlington, Va.
G. C. Taylor.
Preprint No. 1910, American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 9 p, 2 ref. Price: $0.50.

Descriptors: *Water allocation (Policy), *Water supply development, *Water resources development, *Water values, Alternate water use, Comprehensive planning, Planning, Natural resources, Competing uses, Non-consumptive use, Aesthetics, Social aspects.

The almost total development of usable water supplies is forcing a change in social and political responses to water management problems. It will be necessary to assign values and prices to water use. Concerns for economic development will need to be balanced against the desire for environmental preservation and control. In most sectors of our economy, the economic value of a commodity has been the governing factor for controlling its use. Such a basis for use of water resources can be inadequate since there are social and environmental factors not reflected in the market value. Water allocations are often made by nonmarket means, and are influenced by power monoplies, lack of knowledge, etc. In some types of water use--such as navigation and recreation--the use of the water is nonconsumptive and the water can be used for other purposes. In other uses, the water is consumed and permanently withdrawn from the water supply under examination. In still other uses the water is returned to the water supply in a polluted form, contaminating a large volume of water than actually used. Each of these types of water use has a different value, although the value may be difficult to assign. Often an overall evaluation of all potential water uses will need to be made to optimize water resource management. (Poertner)
W73-12008

JUDICIAL-ORIENTED INSTITUTIONAL SOLUTIONS: SAN GABRIEL VALLEY EXPERIENCE,
Clayson, Stark, Rothrock and Mann, Corona, Calif.
For primary bibliographic entry see Field 04B.
W73-12009

FLASH FLOOD FORECASTING AND WARNING PROGRAM IN THE WESTERN REGION,
National Weather Service, Salt Lake City, Utah. Western Region.
For primary bibliographic entry see Field 02E.
W73-12020

ENVIRONMENTAL LAW--EXPANDING THE DEFINITION OF PUBLIC TRUST USES,
For primary bibliographic entry see Field 06E.
W73-12211

CONSENSUS: THE FIRST STEP,
Northeastern Illinois Planning Commission, Chicago.
M. L. Rockwell.
Water Spectrum, Vol 5, No 1, p 9-16, 1973. 9 photo.

Descriptors: *Flood control, *Coordination, Urbanization, Storm water, Planning, Flood plains, Conferences, Illinois.
Identifiers: *Flood plain management, Chicago, Northeastern Illinois Planning Commission (NIPC), Public involvement.

Flood plain management in heavily urbanized northeastern Illinois where severe flooding has recently occurred is discussed. The Northeastern Illinois Planning Commission has been quite active in advocating flood plain management and carrying out various programs such as flood hazard mapping. However, the results have been limited as urbanization of flood plain areas has proceeded rapidly. With the recent flooding, public concern for flood control and flood plain management has increased considerably and several meetings have been held. The most significant meeting was a Storm Water Conference on March 10, 1973, attended by 550 citizens and elected officials. One result of the Conference was the ranking of various alternative solutions of flood control such as reservoirs, storm sewer systems, land use controls, and channel improvements. The highest ranked alternative was the on-site detention of storm water, particularly in large developments. (Elfers-North Carolina)
W73-12234

6G. Ecologic Impact of Water Development

DEPARTMENT OF ENVIRONMENTAL QUALITY; EXECUTIVE COMMITTEE.
For primary bibliographic entry see Field 06E.
W73-11964

MARINE SANCTUARIES IN CALIFORNIA.
For primary bibliographic entry see Field 06E.
W73-11973

SOIL CONSERVATION AND FLOOD CONTROL DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11979

INTERSTATE DRAINAGE DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-11981

GREAT LAKES RIVER BASINS COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11984

FLOOD CONTROL.
For primary bibliographic entry see Field 06E.
W73-11987

UPPER MISSISSIPPI RIVERWAY COMPACT.
For primary bibliographic entry see Field 06E.
W73-11989

PROTECTION FROM FLOODS.
For primary bibliographic entry see Field 06E.
W73-11990

WATER QUALITY COMMISSION.
For primary bibliographic entry see Field 06E.
W73-11991

DEEP DRAFT HARBOR AND TERMINAL AUTHORITY.
For primary bibliographic entry see Field 06E.
W73-11994

KEHOE LAKE, TYGARTS CREEK, KENTUCKY (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 06E.
W73-11999

WATER AND AIR POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W73-12003

THE EFFECTS OF PLUGGING A DEEP ARTESIAN WELL ON THE CONCENTRATION OF CHLORIDE IN WATER IN THE WATER-TABLE AQUIFER AT HIGHLAND ESTATES, LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02F.
W73-12039

FLOOD PLAIN REPORT - CITY OF SOUTHFIELD.
Southfield City Administrator's Office, Mich.
For primary bibliographic entry see Field 04A.
W73-12045

NATIONAL LAND USE POLICY: OBJECTIVES, COMPONENTS, IMPLEMENTATION.
For primary bibliographic entry see Field 06E.
W73-12048

IMPACT OF NATURAL FACTORS ON WATER USE (VLIYANIYE PRIRODNYKH FAKTOROV NA VODOPOTREBLENIYE),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
N. I. Koronkevich.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 5, p 54-63, September-October 1972. 4 fig, 2 tab, 23 ref.

Descriptors: *Environment, *Environmental effects, *Water utilization, *Use rates, *Water users, Water consumption (Except consumptive use), Consumptive use, Water supply, Water requirements, Water types, Thermal powerplants, Industries, Agriculture, Water temperature, Evaporation, United States.

The amount of water being used by various sectors of the Soviet economy is increasing each year. Although environmental factors affect virtually all items in the water balance, they tend to be ignored in establishing water-use rates and in estimating water consumption. An analysis is made of the impact of environmental factors on the volume of water used by major consumers, including thermal powerplants, industry, domestic and municipal water users, and agriculture. In most sectors of the economy there is a clearly defined relationship between water consumption and the natural environment. Gross water use in the steppe zone of the USSR is generally 20%-30% higher than in the taiga, with an even greater difference in consumptive use. Environmental conditions in the United States account for use rates in industry and thermal-power generation that are 25%-30% higher than in the Soviet Union, while domestic and municipal water requirements in the United States are 20% higher. The differences in consumptive use are even greater. (Josefson-USGS)
W73-12062

RED RIVER EMERGENCY BANK PROTECTION, LOUISIANA, ARKANSAS, AND TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 04A.
W73-12196

HORSE RANGE SWAMP WATERSHED PROJECT, ORANGEBURG COUNTY, SOUTH CAROLINA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Columbia, S.C.
For primary bibliographic entry see Field 04D.
W73-12201

LITTLE RIVER INLET NORTH CAROLINA AND SOUTH CAROLINA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W73-12202

AQUATIC PLANT CONTROL AND ERADICATION PROGRAM, STATE OF TEXAS (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W73-12203

ENVIRONMENTAL POLICY.
For primary bibliographic entry see Field 06E.
W73-12228

NATURAL FEATURES IN BURLINGTON COUNTY.
Burlington County Planning Board, Mount Holly, N.J.

February, 1973. 50 p, 4 tab, 24 maps, 3 append. HUD N.J. P-132.

Descriptors: *Natural resources, Physiography, Climate, Geology, Groundwater, Soils, Urban land use, Agriculture, Erosion control, Aquifers, *New Jersey.
Identifiers: *Burlington County (New Jersey), Urban development constraints, Land use sutability.

The rich and varied natural setting of Burlington County that provides a setting for scientific study, recreation and everyday living is examined. Limitations on development due to natural factors are discussed. Inventories and descriptions of natural features of the county are divided into physiography and climate, geology and hydrology, soils, and animal and plant life. With regard to water resources, the emphasis is on groundwater aquifers and soil suitability for septic tanks. Maps indicate specific areas of the county that are not suitable for various activities or types of development. These include not only general categories such as residential development but also specific uses such as streets and parking lots, parks and playgrounds, sanitary landfills, small building foundations, and areas suitable for certain crops. Recommendations include encouragement of passing flood control and erosion control ordinances, establishment of more stations to monitor environmental conditions, preservation of open spaces and tree preservation especially in subdivisions, discouraging premature development of farm lands, and acquiring of lineal parks along streams in the townships to attack drainage problems along major streams. (Elfers-North Carolina)
W73-12241

SOME CONSERVATIONAL PROBLEMS POSED BY HYDROELECTRIC POWER INSTALLATIONS IN ALBERTA,
Department of Lands and Forests, Lethbridge (Alberta).
For primary bibliographic entry see Field 05C.
W73-12268

ENVIRONMENTAL CONTROL SYSTEMS: TREATMENT OF UNCERTAINTY IN MODELS AND DATA,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-12271

THE ENVIRONMENTAL IMPACT OF GROUND WATER USE ON CAPE COD--IMPACT STUDY NO. 3,
For primary bibliographic entry see Field 05B.
W73-12303

ENVIRONMENTAL GUIDE FOR THE U.S. GULF COAST,
National Climatic Center, Ashville, N.C.
W. A. Brower, J. M. Meserve, and R. G. Quayle.
Available from NTIS, Springfield, Va 22151 as AD-758-455 Price $3.00 printed copy; $1.45 microfiche. Report, November 1972. 179 p, 8 fig, 46 tab, 44 ref, 2 append.

Descriptors: *Harbors, *Gulf of Mexico, *United States, *Engineering structures, Environmental effects, Investigations, Feasibility, Ecology, Planning, Hydrologic data, Climatic data, Meteorological data, Evaluation, Texas, Louisiana, Mississippi, Alabama, Florida.
Identifiers: Pre-construction data, Environmental profiles.

Detailed environmental profiles are presented for seven potential Gulf Coast Deep Water Port sites: Corpus Christi, Galveston-Freeport, Sabine Pass, Bayou Lafourceh, Southwest Pass, Mobile-Pascagoula, and Panama City. Information for each area provides: general description of the area, an area map, pressure, extratropical cyclones, tropical cyclones, winds, extreme winds, waves, visibility, temperature (air and sea), precipitation, cloudiness, relative humidity, and land station summaries, as well as marine area summaries. (Woodard-USGS)
W73-12310

07. RESOURCES DATA

7A. Network Design

WATER RESOURCES DATA IN ALABAMA,
Auburn Univ., Alabama. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-12074

REPORT OF ANALYSES OF WATER SAMPLES SUBMITTED TO SCRIPPS NOVEMBER 1971 FOR THE LAKE MICHIGAN INTERCALIBRATION/INTERCOMPARISON PROGRAM (EIIP),
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Lab.
For primary bibliographic entry see Field 05A.
W73-12156

THE DESIGN OF OPTIMAL PRECIPITATION MEASURING NETWORKS FOR FLOOD FORECASTING,
Enviro-Engineers Ltd., Cincinnati, Ohio.
For primary bibliographic entry see Field 02B.
W73-12292

INFORMATION TRANSFER VIA REGRESSION IN MARKOVIAN WORLDS,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 06A.
W73-12294

FEASIBILITY STUDY OF THE EXPLOITATION OF ELECTROMAGNETIC SURFACE WAVE PROPAGATION FOR MINERAL PROSPECTING AND MAPPING THE WATER TABLE,
Nebraska Univ., Lincoln. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 02F.
W73-12311

DESIGN OF USAF WATER QUALITY MONITORING PROGRAMS,
Air Force Adademy, Colo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W73-12317

7B. Data Acquisition

THE EFFECTS OF A SUBARCTIC GLACIER ON RADIO-WAVE PROPAGATION IN SUMMER,
University of Electro-Communications, Tokyo (Japan).
For primary bibliographic entry see Field 02C.
W73-11804

PATTERNS OF SURFACE TEMPERATURE IN THE ALPINE/PERIGLACIAL ENVIRONMENT AS DETERMINED BY RADIOMETRIC MEASUREMENTS,
State Univ. Coll., Geneseo, N.Y. Dept. of Geography.
For primary bibliographic entry see Field 02C.
W73-11806

DIGITAL TELEMETRY--FUNCTIONAL DESCRIPTION AND SPECIFICATIONS,
Geological Survey, Washington, D.C. Water Resources Div.
G. F. Smoot, and R. H. Billings.
Geological Survey open-file report, 1969. 27 p, 3 fig.

Descriptors: *Telemetry, *Digital computers, *Hydrologic data, *Remote sensing, Methodology, Remote control, Control systems, Data collections, Data transmission, Costs.
Identifiers: *Digital telemetry.

A digital telemetry system designed for transmission of hydrologic data is described. This system provides for data reception in a computer-compatible form. Usually, the main disadvantage of a digital telemetry system is its high initial cost. However, because the U.S. Geological Survey is already recording data at many of its sites in BCD (Binary Coded Decimal) form utilizing an ADR (Analog-to-Digital Recorder), a large part of the cost--that required for analog-to-digital conversion--is eliminated. Furthermore, due to the less stringent transmission facility requirements, operating costs generally are lower than comparable analog systems. (Woodard-USGS)
W73-11815

POSSIBILITY OF USING STORAGE PRECIPITATION GAGES TO IMPROVE THE ACCURACY OF PRECIPITATION DATA IN THE UKRAINIAN CARPATHIANS (O VOZMOZHNOSTI UTOCHNENIYA KOLICHESTVA OSADKOV V UKRAINSKIKH KARPATAKH PO DANNYM SUMMARNYKH OSADKOMEROV),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02B.
W73-11828

IN SITU SAMPLER FOR MARINE SEDIMENTARY PORE WATERS: EVIDENCE FOR POTASSIUM DEPLETION AND CALCIUM ENRICHMENT,
Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
F. L. Sayles, T. R. S. Wilson, D. N. Hume, and P. C. Mangelsdorf, Jr.
Science, Vol 181, No 4095, p 154-156, July 13, 1973. 2 fig, 11 ref.

Descriptors: *Sampling, *Pore water, *Connate water, *Bottom sediments, Sea water, Diagenesis, Water chemistry, Cores, Potassium, Calcium, Core drilling.

A device was developed for sampling the interstitial waters of deep sea sediments in situ. The sampler collects a series of samples over a depth of 1.5 meters in the sediment and thus makes possible the accurate delineation of chemical gradients in the pore waters. Samples collected in the North Atlantic show significant gradients of K and Ca. Interstitial solutions sampled between Ireland and Cape Cod, Massachusetts, are characterized by the depletion of K and the enrichment of Ca. (Knapp-USGS)
W73-11840

DEPTH INTERVALS AND TOPSOIL MOISTURE MEASUREMENT WITH THE NEUTRON DEPTH PROBE,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark).
For primary bibliographic entry see Field 02G.
W73-11841

MEASUREMENTS OF CURRENTS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 02E.
W73-11850

IMPLICATIONS OF A SYSTEMS APPROACH TO OCEANOGRAPHY,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 06A.
W73-11868

ISOTOPE METHODS IN GROUNDWATER SCIENCE (ISOTOPENMETHODEN IN DER GRUNDWASSERKUNDE),
European Atomic Energy Community, Brussels (Belgium). Bureau Eurisotop.
For primary bibliographic entry see Field 02F.
W73-11929

USE OF SATELLITE IMAGERY FOR WILDLAND RESOURCE EVALUATION IN THE GREAT BASIN,
Nevada Univ., Reno. Remote Sensing Lab.
P. T. Tueller.
Available from NTIS Springfield, Va 22151 E-73-10019. Price $3.00 printed copy; $1.45 microfiche. Nevada University Remote Sensing Laboratory report, January 3, 1973. 9 p, 1 tab.

Descriptors: *Remote sensing, *Photography, *Satellites (Artificial), *Nevada, Instrumentation, Mapping, Photometry.
Identifiers: *ERTS.

Accomplishments of the University of Nevada ERTS program are summarized. A detailed quantification was made of crested wheatgrass seedings within the state of Nevada. Within each county seedings were identified, delineated, and quantified using the MSS seven band from September 13-17, 1972. This band has proven the most useful for identification and quantification of seedings. Large scale photography and reference maps verified many seedings, some of which were difficult to identify positively with ERTS imagery. Identification and quantification of water bodies is being attempted. Using ERTS imagery and the MSS seven band, most water bodies are easily identified. An increase or decrease in water quantity will be reflected in a corresponding increase or decrease of surface area. Fire scars, both recent and old, are being inventoried and monitored. A quantitative estimate of the number of acres burned may be obtained easily. The sequential nature of the ERTS data is particularly well adapted for this type of inventory. Sequential imagery aids in detecting changes in playas. Phreatophytic vegetation was partly quantified along the Truckee River and the Las Vagas Wash, using ERTS imagery. (Knapp-USGS)
W73-12021

EFFECT OF MULTIPLE SCATTERING ON RADIANT ENERGY TRANSFER IN WATERS,
Purdue Univ., Lafayette, Ind. Heat Transfer Lab.
For primary bibliographic entry see Field 01A.
W73-12080

MICROWAVE SIGNATURES OF FIRST-YEAR AND MULTIYEAR SEA ICE,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
P. Gloersen, W. Nordberg, T. J. Schmugge, T. T. Wilheit, and W. J. Campbell.
Journal of Geophysical Research, Vol 78, No 18, p 3564-3572, June 20, 1973. 3 fig, 1 tab, 12 ref.

Descriptors: *Sea ice, *Microwaves, *Remote sensing, *Ice cover, Instrumentation, Aerial photography, Temperature, Salinity.
Identifiers: Microwave radiometers.

A combination of remote sensing from an aircraft and simultaneous surface measurements confirm the feasibility of identifying old and new sea ice according to its emission of thermal radiation at wavelengths between 0.3 and 3 cm. Emissivity of first-year thick ice with a surface temperature of about 260K is 0.95 or greater for wavelengths between 0.81 and 11 cm; the emissivity of multiyear ice is 0.8 at 0.81 cm and 0.95 at 11 cm, increasing monotonically in this wavelength interval. The ease with which multiyear ice can be distinguished from first-year ice using a passive microwave radiometer was demonstrated by comparing mosaics prepared both from photographs and images of 1.55-cm radiation. (Knapp-USGS)
W73-12081

EDDY CORRELATION MEASUREMENTS OF EVAPORATION AND SENSIBLE HEAT FLUX OVER ARCTIC SEA ICE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 02D.
W73-12083

A SUBMERSIBLE SPECTRORADIOMETER AND DATA ACQUISITION SYSTEM,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W73-12135

AUTOMATIC METER READING USING EXISTING TELEPHONE CIRCUITS,
Utilities Telecommunications Council, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-12145

A UNIFIED METHOD FOR THE RECONSTRUCTION OF SAMPLED DATA,
Florida Univ., Gainesville. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 05A.
W73-12147

RADIOMETER FOR AQUATIC USE,
Department of Agriculture, Lethbridge (Alberta). Research Station.
J. R. Allan, and R. G. Fuhrer.
Can J Plant Sci. Vol 52, No 3, p 405-408. 1972. Illus.
Identifiers: *Radiometer, *Instrumentation.

The radiometer of Gaudet and Damm (1968) is modified as a detachable, inexpensive, portable and waterproof light sensor that can be installed permanently in lentic and lotic environments.–Copyright 1972, Biological Abstracts, Inc.
W73-12185

THE EVALUATION AND APPLICATION OF C-14 DATING OF GROUNDWATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-12297

REMOTE SENSING STUDY OF THERMAL DISCHARGES TO LAKE MICHIGAN, WISCONSIN, ILLIONOIS, INDIANA, AND MICHIGAN.
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-12309

7C. Evaluation, Processing and Publication

DETERMINING IRRIGATION POTENTIAL - A COMPUTER MODEL,
For primary bibliographic entry see Field 03F.
W73-11734

USE OF SATELLITE IMAGERY FOR WILDLAND RESOURCE EVALUATION IN THE GREAT BASIN,
Nevada Univ., Reno. Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W73-12021

THE USE OF ERTS-1 IMAGERY IN THE NATIONAL PROGRAM FOR THE INSPECTION OF DAMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. L. McKim, T. L. Marlar, and D. M. Anderson.
Available from NTIS, Springfield, Va 22151 as AD-754 579 Price $3.00 printed copy; $1.45 microfiche. Special Report SR 183, December 1972. 16 p, 9 fig, 2 tab, 3 ref, append.

Descriptors: *Remote sensing, *Satellites (Artificial), *Dams, *Reservoirs, Surveys, Aerial photography, Photogrammetry, Drainage patterns (Geologic), Lakes.
Identifiers: *ERTS imagery.

ERTS-1 imagery can be useful in locating water bodies over 152 m in diameter. Dams on streams can be identified by an abrupt change in stream width. A linear termination on a water body is a reliable indication of a dam, particularly when it is inconsistent with the normal drainage pattern. Care must be exercised to avoid confusing cloud shadows with water bodies. However, the association of a cloud with its shadow usually can be accomplished since the sun angle is noted in the data given on each ERTS image. The location of water bodies, the size and shape of water bodies, identification of dam sites on major rivers, the direction of stream flow of major hydrologic networks, relative water depths, and gross sedimentation patterns may be determined from ERTS imagery. ERTS-1 imagery, in general, does not supply information suitable for determining dam height, type of dam construction, depth of water bodies, or location of water bodies less than 6 acres. (Knapp-USGS)
W73-12028

NATURAL RESOURCE INFORMATION SYSTEM, VOLUMES I AND II.
Boeing Computer Services, Inc., Seattle, Wash.
For primary bibliographic entry see Field 06A.
W73-12040

HYDRAULIC NETWORK ANALYSIS USING LINEAR THEORY,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
D. J. Wood, and C. O. A. Charles.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY7, Paper 9031, p 1157-1170, July 1972. 2 fig, 5 tab, 22 ref, append. OWRR B-017-KY (2).

Descriptors: *Pipe flow, *Closed conduit flow, *Hydraulic systems, *Head loss, Mathematical models, Equations, Fluid mechanics, Computer programs.
Identifiers: Hydraulic networks, Linear analysis.

A method of analyzing flow distribution in hydraulic networks is presented. Basically, this method uses a linearized head loss term which allows a network of n pipes to be described by a set of n linear equations which can be solved simultaneously for the flow distribution. Because of the linear approximations used, several trials will be required to get an accurate solution. This method of analyzing hydraulic networks is characterized by an assured convergence which is very rapid when compared to other available methods. One reason for this is that it is possible to compute a fairly accurate initial flow distribution and no initial estimates are required. In addition, the method applies directly to both closed loop systems and open-closed loop systems. The method is also easy to program for solution on a digital computer. (Woodard-USGS)
W73-12041

THE PREDICTION OF SOIL OCCURRENCE IN CERTAIN DESERT REGIONS OF THE SOUTHWESTERN UNITED STATES,
Soil Conservation Service, University Park, N. Mex.
For primary bibliographic entry see Field 02G.
W73-12256

INTERNATIONAL SYMPOSIUM ON UNCERTAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. I.
For primary bibliographic entry see Field 04A.
W73-12269

EVALUATION OF SEASONAL TIME-SERIES MODELS: APPLICATIONS TO MID-WEST RIVER FLOW DATA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
A. I. McKerchar, and J. W. Delleur.
In: Proceedings (Vol I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 31-47, (1972) 4 fig, 2 tab, 13 ref.

Descriptors: *River flow, *Forecasting, *Stochastic processes, *Seasonal, *Ohio River, *Evaluation, *Hydrologic data, Time series analysis, Mathematical models, Monthly, Tributaries, Water resources development, Optimum development plans, Equations, Systems analysis.
Identifiers: Mid-west, Daily flows, Synthetic data.

Stochastic models are well fitted to hydrologic data: They enable forecasts of the data one and more time periods ahead, and they enable the generation of sequences of synthetic data. These techniques are of considerable importance to the design and operation of water resource systems. Short sequences of data lead to uncertainties in the estimation of model parameters and to doubts about the appropriateness of particular time series models; a premium is placed on models that are economical in terms of the number of parameters required. Two models that take account of seasonal and persistence effects in runoff data are described and fit 16 series of monthly flows for rivers that are tributaries to the lower Ohio River. These models are: (A) an autoregressive model, a conventional Thomas-Fiering type model, in which individual monthly means and standard deviations are explicitly accounted for; and (B) a multiplicative ARIMA (autoregression-integrated-moving-average) model of the type described by Box and Jenkins. Consideration of the forecasts shows that both models represent the seasonal variations in monthly means. However, model B does not account for the seasonal variability in monthly standard deviations; for this reason its utility is restricted. (See also W73-12269) (Bell-Cornell)
W73-12272

TECHNOLOGICAL UNCERTAINTY IN THE ECONOMIC EVALUATION OF NEW WATER RESOURCES,
Hawaii Univ., Honolulu. Coll. of Business Administration.
For primary bibliographic entry see Field 06A.
W73-12273

METHODS FOR ASSESSING VARIABILITY, WITH EMPHASIS ON SIMULATION DATA INTERPRETATIONS,
Naval Postgraduate School, Monterey, Calif.
D. P. Gaver.
In: Proceedings (Vol. *), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 64-90, (1972). 18 tab, 8 ref.

Descriptors: *Simulation analysis, *Stochastic processes, *Monte Carlo method, *Estimating, *Variability, Computers, Equations, Distribution, Operation research, Mathematical models, Hydrology.
Identifiers: *'Jackknife' method, Antithetic variates technique.

The problem of assessing and comparing the variability of complex functions of random variable realizations is important in many applied areas, including hydrology. Difficulties stem from nonrobustness: For example, the usual (normal distribution based) confidence limits for variances based on the chi-squared statistic often turn out to be narrow (non-conservative) and thus to falsely overstate confidence when data is non-normal. Promising results are described of some exploratory simulations to evaluate the small-sample characteristics of new variance (and also mean) estimates. Investigated is the performance of one useful method, the 'jackknife' of Quenouille and Tukey, for setting confidence limits on the variance or standard deviation of an unknown distribution. By using empirical sampling employing a computer, it is shown that the jackknife method seems to be an improvement upon normal-theory methods. Finally, the performance of the jackknife method for anlyzing a stochastic simulation experiment is discussed. The simulation makes use of the Monte Carlo technique known as antithetic

variates; this technique is introduced in order to improve simulation efficiency. (See also W73-12269) (Bell-Cornell)
W73-12274

EVALUATION OF PREDICTION ERROR PROBABILITIES FROM STOCHASTIC MODELS BY SIMULATION,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 04A.
W73-12275

FLOOD EVALUATION - CAN STOCHASTIC MODELS PROVIDE AN ANSWER,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. Kottegoda.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 105-114, (1972). 3 fig, 8 ref.

Descriptors: Floods, *Flood data, *Evaluation, *Stochastic processes, *Monte Carlo method, *Climatic zones, Design, Flood peak, Probability, Distribution, Mathematical models, Systems analysis, Meteorological data, River flow.
Identifiers: *Data generation, *Wye River (Wales), British Isles, Value data, Autoregressive models, Pearson-type distributions, Seasonal, Historical data.

Stochastic analysis of floods is a field of research which has been comparatively untouched. The fitting of theoretical distribution functions to series of extreme value data has serious limitations. Inherent uncertainties and misconceptions mar the probable maximum precipitation method used in the design of major spillways. Data generation is a fruitful field of research. Monte Carlo or data generation methods offer a wide array of stochastic process for the investigation of extreme events. In this study, data is generated on the basis of an autoregressive model which seems appropriate when the climatological zone of the British Isles is considered. The fourth order autoregressive model is fitted to a five-day riverflow series from a Welsh catchment. The Pearsonian family of distribution functions is closely examined; appropriate Pearson-type distributions are fitted seasonally using an exact and rapid transformation procedure. The generated pentad data is segmented to form daily flows. Results from the application to a 35 year record of the river Wye at Rhyader in mid-Wales are compared with Poisson and physical techniques. (See also W73-12269) (Bell-Cornell)
W73-12276

BIAS, ILLUSION, AND DENIAL AS DATA UNCERTAINTIES,
Geological Survey, Washington, D.C.
J. R. Slack.
In: Proceedings (Vol. I), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 122-132, (1972). 15 ref.

Descriptors: *Synthetic hydrology, *Streamflow, *Stochastic processes, *Water resources, Planning, Constraints, Estimation, Model studies, Systems analysis, *Risks.

The application of mathematical models to the generation of synthetic flows can lead to a number of problems concerning the adequacy of synthetic flow traces in water resources planning. A stochastic model is usually selected for its theoretical ability to preserve certain statistics and its apparent analogy with the real-world process. The successful application of the model requires that the questions of bias, illusion, and denial be resolved. Bias inherent in the generating process must be discovered and overcome; while a given model will in theoretical expectation for infinite samples preserve a given statistic, the model may produce finite samples having on the average statistics different from the 'expected' statistics. The modeler must understand that every historic record is no more than an illusion of the real world; a single finite realization (historic record) of a random process rarely has sample estimates equal to the population parameters. The possibility that a model may deny itself must be explored. Many stochastic models are quite capable of producing finite samples having statistics which are outside the domain of driving parameters acceptable to the model. Each of these uncertainties is due to the unsteady nature of finite realization of a random process. Each is an artifact of the assumed model. (See also W73-12269) (Bell-Cornell)
W73-12278

REDUCTION OF UNCERTAINTIES IN AUTOCORRELATION BY THE USE OF PHYSICAL MODELS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W73-12283

EFFECT OF LENGTH OF RECORDS OF MONTHLY FLOWS ON THE FIRST SERIAL CORRELATION COEFFICIENT,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 02E.
W73-12285

UNCERTAINTIES IN POINT AND AREAL SAMPLING OF PRECIPITATION AND THEIR IMPORTANCE IN HYDROLOGIC COMPUTATIONS,
Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development.
For primary bibliographic entry see Field 02B.
W73-12290

SPACE-TIME UNCERTAINTIES IN PRECIPITATION MEASUREMENT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02B.
W73-12293

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE JULESBURG REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W73-12296

GREAT LAKES WATER LEVELS, 1970, DAILY AND MONTHLY AVERAGE WATER SURFACE ELEVATIONS.
National Ocean Survey, Detroit, Mich. Lake Survey Center.

Available from NTIS, Springfield, Va. 22151 as COM-73 10271 Price $3.00 printed copy; $1.45 microfiche. National Ocean Survey Report, August 1972. 108 p.

Descriptors: *Water level fluctuations, *Great Lakes, *Basic data collections, Gaging stations, Networks, Elevation, Surface waters, Water level recorders, Lakes, Sites, Rivers, Tributaries, Inflow.

Lake Survey Center Great Lakes and tributary water level gage records are presented for daily and monthly average levels for each of the 60 sites in the network during the 1970 calendar year. In a separate table the highest and lowest daily average are shown for the month. In addition a frequency distribution table of daily average levels shows the number of times each month the recorded levels were above a specified elevation. The gages record water levels in either an analog or a digital form a strip charts which are retained for a period of ten years. Recorded hourly values were used to compute the daily averages, and the monthly values were compiled from the daily averages. (Woodard-USGS)
W73-12298

PRECIPITATION PROBABILITIES FOR KENTUCKY,
Kentucky Agricultural Experiment Station, Lexington.
For primary bibliographic entry see Field 02B.
W73-12304

NUMERICAL MODEL STUDIES OF THE ST. LAWRENCE RIVER,
National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
For primary bibliographic entry see Field 02L.
W73-12313

MODULES FOR INTEGRATED AQUATIC MODELING,
For primary bibliographic entry see Field 05B.
W73-12325

08. ENGINEERING WORKS

8A. Structures

MECHANISMS OF ENERGY ABSORPTION IN SPEICAL DEVISES FOR USE IN EARTHQUAKE RESISTANT STRUCTURES,
California Univ., Berkeley.
J. M. Kelly, R. I. Skinner, and A. J. Heine.
Bull N Z Soc Earthquake Eng, Vol 5, No 3, p 63-88, Sept 1972. 20 fig, 2 tab, 14 ref.

Descriptors: *Energy absorption, *Seismic design, Structural design, Steel structures, Reinforced concrete, Plastic deformation, Laboratory tests, Fatigue (Materials), Flexibility, Ductility, Dynamic loads, Fatigue (Materials), Torsion bridge piers.

A structure designed to resist earthquake attack must have the capacity to dissipate kinetic energy. Recent research has shown that beam-to-column connections in steel and reinforced concrete frames are not reliable when subjected to cyclic loading. Throughout the world, efforts are directed toward increasing the reliability and energy absorption capacity of structural connections. An alternative is to separate the load-carrying function of the structure from the energy-absorbing function and to determine whether special devices could be incorporated into the structure with the sole purpose of absorbing the kinetic energy. The 3 energy-absorbing devices tested included the rolling of strips, torsion of square and rectangular bars, and the flexure of short, thick beams. Characteristics of primary importance were: (1) load displacement relations, (2) energy absorption capacity, and (3) fatigue resistance. Tests show that the plastic torsion of mild steel is very efficient for energy absorption. The other 2 mechanisms studied were both less efficient and less reliable than torsion, but are adaptable to more compact devices and are readily accessible for replacement after use. (USBR)
W73-11725

THE REVIN PUMPED-STORAGE PLANT,
Electricite de France, Paris.
For primary bibliographic entry see Field 08C.
W73-11726

SHIELD TUNNELLING WITH LINER PLATES,
Wayss und Freytag KG, Frankfurt-am-Main (West Germany).
O. E. Engelmann, and D. Mornhinweg.
Tunnels Tunnelling, Vol 4, No 6, p 525-531, Nov 1972. 8 fig, 2 chart, 4 ref.

Descriptors: *Tunnel construction, Tunneling, Tunnel lining, Tunnels, Tunneling machines, Tunnel design, Load distribution, Construction methods, Stress analysis.
Identifiers: *Tunnel supports, *Liner plates, Boring machines, Shields, Vertical loads, Axial loads, Construction methods, Foreign construction, Buckling, Stress analysis.

Use of the shield tunneling method with steel liner plates in Germany is described. This method has proved highly successful for driving small diameter tunnels in soft ground, where excessive ground water was encountered, and when tunneling under compressed air conditions was advantageous. The new technique was found to be competitive in cost and is better suited to soft ground tunneling. A general description of the liner plates and strength analysis of the flexible liner plates to earth pressure are presented. Determination of the load-carrying capacity of liner plates using a Terzaghi method and comprehensive tests by the Illinois Institute of Technology, Chicago, are discussed. From these test, diagrams were made for each plate thickness showing the load under which different diameter liner plates collapse by buckling. Details of a shield tunneling machine are illustrated; 3 tunneling projects using this method are described. (USBR)
W73-11732

NEW CONTINUOUS-FLOW PROCESS FOR BLAST-HOLE DRILLING IN HYDRAULIC-ENGINEERING, RECLAMATION, AND WATER-RESOURCES CONSTRUCTION,
Severyni Nauchno-Issledoatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 08H.
W73-11733

DEFLECTIONS OF PRESTRESSED CONCRETE BRIDGES IN JAPAN,
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 08F.
W73-11735

APPLICATION OF CATHODIC PROTECTION,
Texas Eastern Transmission Corp., Shreveport, La.
For primary bibliographic entry see Field 08G.
W73-11736

THE HENDRIK VERWOERD DAM OF THE ORANGE RIVER PROJECT, SOUTH AFRICA.
South African Embassy, London (England).

Water Eng, Vol 76, No 919, September 1972. 7 p, 1 map, 8 photo.

Descriptors: *Tunnels, *Radial gates, Water resources development, Sedimentation, Sediment control, Hydraulic structures, Hydroelectric power, Multiple purpose projects, Hydraulic turbines, Recreation, Flood control, Dam construction, Design, Dam design, Foreign projects, Concrete dams.
Identifiers: *Double-curvature arch dams, *Intake towers, Construction methods, South Africa, *Hendrik Verwoerd Dam (South Africa), *Orange River Dev Proj (South Africa), Orange River (South Africa).

Features of the Hendrik Verwoerd Dam, the principal component of the Orange River Development Project, are described. This dam impounds the largest man-made lake in South Africa behind a double-curvature main arch and 2 concrete gravity flank walls forming artificial gravity abutments. Approved in 1962, the project is scheduled for completion about 1990. Water from the project will be used for irrigation, urban and industrial purposes, hydroelectric power, and recreation. Design features of the dam and the intake for the Orange-Fish Tunnel are given. The Orange-Fish Tunnel, the second-longest (51.4 mi) water conduit in the world, will divert water from the Orange River Basin to the Eastern Cape Province for irrigation and industrial use. Because of the heavy silt load carried by the river, special considerations were given to sediment storage. A program to educate farmers in modern soil conservation methods and improved farming techniques has been instituted as an effective method of combating siltation by preventing soil erosion. Ultimately the installed capacity will be 320 mw. (USBR)
W73-11740

AN UNDERGROUND STORAGE RESERVOIR AS AN ARTIFICIAL STRUCTURE,
Energoprojekt, Belgrade (Yugoslavia).
J. Bozidar.
Water Power, Vol 24, No 10, p 375-381, Oct 1972. 7 fig.

Descriptors: Tunnels, Underground storage, Underground structures, Reservoirs, Hydroelectric powerplants, Hydraulic structures, *Power system operation, Fluid flow, Hydraulics, Unsteady flow, Turbines, Generators, Foreign projects, Water resources development, Reservoir operation, Surge tanks.
Identifiers: Yugoslavia, *Underground water storage, *Transient flow.

Lack of suitable damsite for the Vrla 3 hydroelectric powerplant in Yugoslavia led to the construction of a network of interconnecting tunnels for operation as an underground storage reservoir. Located at the beginning of the Vrla 3 supply tunnel, the underground storage tunnel has a total length of 2,000 m and a capacity of 30,000 cu m. The 2.75-m-dia supply tunnel is 7,333 m long and is also used partly as a storage reservoir. Design discharge is 16 cu m per sec for 2 generating units. Using half the design discharge, 1 unit has been running since 1957; operation of the reservoir has been satisfactory. The supply tunnel is designed to function normally under pressure during power generation, and as a free surface channel when the reservoir is empty. To permit tunnel operation in 2 different regimes. 2 basic problems to be solved were: (1) to protect the penstock against the entrainment of air from the surge tank and the supply tunnel during operation, and (2) to assure rapid and efficient discharge of air from the tunnel during filling. Analyses of model investigations of the transient flow occurring during the emptying and filling of the tunnel are presented. Possible operating difficulties with the system when the second unit is placed in service in 1973-75 are discussed. (USBR)
W73-11741

AN APPROACH TO UNDERGROUND CONSTRUCTION,
D'Appolonia (E.) Consulting Engineers, Inc., Pittsburgh, Pa.
T. L. Neff.
Paper, 15th Annu Meeting Assoc Eng Geol, Kansas City, Mo, Oct 1972. 24 p, 3 fig, 9 ref.

Descriptors: *Costs, *Contract administration, Construction, *Tunnel construction, Competitive prices, Scheduling, Design, Contracts, Construction costs, Management, Environmental engineering, Research and development, Specifications, Tunneling, Tunnels.
Identifiers: *Cost savings, Underground openings.

Underground construction has greatly increased because of environmental advantages, especially in and near metropolitan centers. However, the underground industry is plagued by inefficiency and lack of flexibility, resulting in cost and time overruns. One of the inherent problems is having to deal with subsurface conditions that cannot be completely known prior to construction. The projected dollar volume of underground construction in the next decade makes seeking immediate ways to lower the cost of such construction imperative. Improvements must be achieved both in development of new and better technology, especially in the application of technology to construction projects. Clearly a breakthrough is needed. One possibility for lowering underground construction costs is a contract that permits engineered construction. A negotiated incentive contract that rewards innovation and efficiency has been proposed. To enable the suggested approach to succeed, strict controls on contingencies, costs, and schedules are necessary. The integrated civil engineering project and the observational approach could provide a sound basis for achieving required controls. (USBR)
W73-11744

THREE-DIMENSIONAL BEHAVIOR OF A CENTRAL CORE DAM,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. B. Palmerton, and G. Lefebvre.
Available from the National Technical Information Service as AD-756 443, $3.00 in paper copy, $1.45 in microfiche. Research Report S-72-1, December 1972. 62 p, 34 fig, 14 ref.

Descriptors: *Dam design, *Design criteria, *Engineering structures, *Stress analysis, Strain, Computer models, Computer programs, Structural analysis, Structural behavior, Valleys.

A three-dimensional finite element computer program is used to investigate the stress and displacement conditions of a dam situated in a narrow steep-walled valley. Nonlinear stress-strain behavior and incremental construction of the dam are included in the analyses. The three-dimensional analyses are compared to the plane strain behavior of a transverse section of the dam and indicate significant differences in the stress behavior. The differences are primarily due to the effect of arching caused by the valley walls. A Stress conditions leading to conditions favorable to horizontal hydraulic fracturing are discussed. (Woodard-USGS)
W73-11822

INVESTIGATION OF MUDFLOWS IN THE CHEREMOSH RIVER BASIN IN CONNECTION WITH DESIGN OF THE ROSTOKI RESERVOIR (ISSLEDOVANIYE SELEY V BASSEYNE R. CHEREMOSH V SVYAZI S PROYEKTIROVANIYEM ROSTOKINSKOGO VODOKHRANILISHCHA),
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02J.
W73-11831

BOWIE DAM AND LAKE PASCAGOULA RIVER BASIN, MISSISSIPPI AND ALABAMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Mobile, Ala.

August 1972. 69 p, 1 map, 1 append.

Descriptors: *Multiple-purpose reservoirs, *Mississippi, *Environmental effects, *Flood control, Reservoirs, Recreation, Flood protection, Multipurpose projects, Water quality control, Agriculture, Land use, Water supply, Wildlife habitats, Dam construction, Earth dams, Water supply development, Reservoir construction, River basin development, Alabama.
Identifiers: *Environmental Impact Statements, *Pascagoula River basin (Mississippi-Alabama).

This multipurpose reservoir project on Bowie Creek in Mississippi is designed for flood control, water supply development, general recreation, and fish and wildlife enhancement. Adverse environmental effects include loss of 5,500 acres of agricultural and forest lands and its associated wildlife habitat, as well as loss of free-flowing stream fisheries and the disruption of inhabitants. Alternative sites and no-development were considered; however, the single purpose projects proved to be less efficacious or economically infeasible. The project would provide extensive flood protection, a dependable water supply, and high quality recreation areas. Additional conversion of woodland to agricultural land may be induced by project implementation. Overall, the basic objective of the program is to plan for the best use, or combination of uses, of water and related land resources to meet all foreseeable short and long-term needs. (Mockler-Florida)
W73-11977

MILLDAMS AND RACES.
For primary bibliographic entry see Field 06E.
W73-11992

BREVARD COUNTY BEACH EROSION CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from National Technical Information Service, U.S. Dept of Commerce as EIS-FL-72-5590-F, $3.75 in paper copy, $1.45 in microfiche. May 1972. 29 p, 1 plate.

Descriptors: *Erosion control, *Environmental effects, *Florida, *Beach erosion, Dredging, Water quality, Recreation, Aquatic animals, Coastal engineering, Shore protection, Sands, Shores, Tidal effects, Benthic fauna, Waves (Water), Littoral drift, Jetties, Turbidity, Beaches.
Identifiers: *Environmental Impact Statements, *Brevard County (Fla).

This project consists of partial restoration of 2.8 miles of Atlantic Ocean shoreline at the city of Cape Canaveral and partial restoration and periodic nourishment of 2 miles of shore at the cities of Indialantic and Melbourne Beach in Brevard County, Florida. Future nourishment of the Cape Canaveral reach would be accomplished by the authorized sand-transfer plant for Canaveral Harbor. About 988,000 cubic yards of material will be initially dredged from offshore and placed on the beach at Cape Canaveral and approximately 603,000 cubic yards of initial fill will be placed on the beach at Indialantic and Melbourne. Dredging will temporarily degrade water quality, cause the beach to be temporarily closed for public use, and will destroy most benthic animals in bottom sediments and cover those in the beach nourishment area. Consideration was given to several alternative plans but it was finally determined the proposed project was the only one which was economically feasible and capable of accomplishing the ultimate objectives. (Mockler-Florida)
W73-11997

ENGINEERING REPORT ON MASON STREET AND MILBANK AVENUE DRAINAGE AND DRAINAGE SYSTEMS, GREENWICH, CONNECTICUT.
Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa.

Greenwich Department of Public Works, Greenwich, Connecticut, March 1, 1972. 37 p, 6 fig, 2 append.

Descriptors: *Storm drains, *Drainage systems, *Evaluation, *Urban drainage, *Flood control, *Sewerage, Storm runoff, Urbanizations, Connecticut, Pipes, Outlets, Tides.
Identifiers: *Greenwich (Conn).

The Town of Greenwich, Connecticut has experienced stormwater flooding in the Mason Street and Milbank Avenue area. This has resulted from increased urbanization and the inability of existing drainage facilities to accept and convey the increased amounts of stormwater runoff. The capacity of existing storm drainage systems in the area was investigated and a preliminary design of a storm drainage system was prepared. The area contains 165 acres, all urbanized. Two separate storm drainage systems exist--along Mason Street where the area is primarily commercial, and along Milbank Avenue where it is predominately a residential area. The terrain is rolling, sloping from the north down to sea level at Long Island Sound. Preliminary designs and cost estimates were made of alternate drainage systems to adequately handle stormwater runoff from the 10, 25, and 50-year storms. Cost vs. storm frequency relationships were analyzed and a system was recommended to handle the runoff from a 10-year storm in the northern and eastern half of the study area. A 25-year design storm event was selected for the southern and western half of the area. As part of the design considerations, tide levels had to be known, since high tides at the sewer outlets reduce the discharge capacity of the drainage system. Total system cost was estimated at $3.4 million with construction extending over a seven-year period. Practically all existing storm drains are recommended for replacement. (Poertner)
W73-12011

THE USE OF ERTS-1 IMAGERY IN THE NATIONAL PROGRAM FOR THE INSPECTION OF DAMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 07C.
W73-12028

RED RIVER EMERGENCY BANK PROTECTION, LOUISIANA, ARKANSAS, AND TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 04A.
W73-12196

LITTLE RIVER INLET NORTH CAROLINA AND SOUTH CAROLINA--NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W73-12202

8B. Hydraulics

CRITERIA FOR STABLE EARTH CHANNEL DESIGN,
Soil Conservation Service, Upper Darby, Pa.
G. E. Oman.
Paper 72-763, 1972 Winter Meeting American Society of Agricultural Engineers, Chicago, Illinois, December 1972. 15 p, 12 fig, 5 ref.

Descriptors: *Channel erosion, *Bank erosion, *Tractive forces, Canal design, Irrigation canals, Channel flow, Design flow, Bank stability, Design criteria, Hydraulic design, Soil erosion, Floodways, Surface drainage, Channels, Canals, Erosion.
Identifiers: Erosion strength, Channel design, Stable channels, Unlined channels, Sediment concentration.

In determining stability of an earth channel against erosion, the Soil Conservation Service uses either the allowable velocity or the allowable tractive stress methods. Both are based on the principle of the threshold of particle movement. The allowable velocity method considers: suspended load in the water, earch material of the channel, depth of the flow, slope of the channel bank, curvature of the channel, and frequency of the design flow. Equations and curves for computing channel stability by the tractive stress method are presented. Problems encountered in using the 2 methods include: (1) criteria are not always explicit; (2) sediment load quantity and effects must be estimated; (3) earth material varies along the channel; (4) consideration must be given for vegetation growing along the channel; (5) methods do not apply to non-cohesive fine-grained materials and dispersable cohesive soils; and (6) corrections based on the roll down effect of the particles are based on limited data. Further evaluation of the performance of existing channels is encouraged. (USBR)
W73-11746

CHANNEL CONDITIONS, DEVIL'S ISLAND REACH, MISSISSIPPI RIVER, MISSOURI AND ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. J. Franco, and C. D. McKellar, Jr.
Available from NTIS, Springfield, Va. 22151 as AD-756 442, Price $3.00 printed copy; $1.45 microfiche. Technical Report H-73-1, February 1973. 29 p, 1 fig, 13 plate.

Descriptors: *Engineering structures, *Canal construction, *Mississippi, *Channels, Bypasses, Hydraulic models, Navigation, Model studies, Channel morphology, Depth, Width, Dikes, Evaluation, Ecology, Environmental effects, Fish, Missouri.
Identifiers: *Devil's Island Reach (Mississippi River).

The Devil's Island Reach of the Mississippi River is located about 5 miles upstream of Cape Girardeau, Missouri, between miles 55.0 and 68.0. A movable-bed model with scale ratios of 1:400 horizontal and 1:100 vertical, reproducing approximately 13.0 miles of the Mississippi River, was used to develop a channel of project dimensions through the reach. Results of the investigation indicated that: contracting the channel in this reach to a control width of 1500 ft should generally provide adequate channel depths and alignment; the control width can be reduced to less than 1500 ft to improve the depth and alignment of the channel over crossings with dikes of lower elevation than those used for the 1500-ft contraction; the cost of dike construction can be reduced by use of the stepped-down principle in the design of dike systems; the plan developed during this study produced the best overall results insofar as navigation is concerned; and the habitat of fish and wildlife can be enhanced by the use of properly designed longitudinal sections on some of the spur dikes. (Woodard-USGS)
W73-11821

A FIELD INVESTIGATION OF ROLLOVER FISH PASS, BOLIVAR PENNINSULA, TEXAS,
Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
S. H. Prather, and R. M. Sorensen.
Available from NTIS, Springfield, Va 22151 as COM-73-10157, Price $3.00 printed copy, $1.45 microfiche. Report No 155 (Sea Grant Publication), 1972. 116 p, 45 fig, 3 tab, 39 ref, 2 append. NOAA TAMU-SG-72-202.

Descriptors: *Hydraulics, *Inlets (Waterways), *Bays, *Gulf of Mexico, *Texas, Fish passages, Tidal effects, Sediment transport, Water circulation, Hydrologic data, Hydraulic properties, Discharge (Water), Flow rates, Sediments, Particle size, Canals, Engineering structures, Evaluation.
Identifiers: *Rollover Fish Pass (Tex), Bolivar Peninsula (Tex).

A field study of Rollover Fish Pass, an artificial tidal inlet connecting Galveston East Bay, Texas, with the Gulf of Mexico, was conducted. The objectives were (1) to evaluate the flow and stability characteristics of the inlet, (2) to investigate the propagation of the tidal wave through the connected bay system, and (3) to evaluate the effect of the inlet on tidal fluctuations and flushing of East Bay. Field work included hydrographic surveys of the inlet and adjacent Gulf beaches, collection and analysis of sediment samples from the inlet and beaches, measurement of tidal fluctuations at selected locations in East Bay, and current measurements in the inlet. Tidal data from the Gulf, provided by the Galveston District, Corps of Engineers, were analyzed along with the field data. The water exchange through the pass is of sufficient magnitude to flush or circulate the waters in the upper end of East Bay, when considered over a long time period. This exchange is probably the greatest contribution the pass makes to the bay system and, by itself, makes the inlet valuable to the area concerned. (Woodard-USGS)
W73-11854

SHOALING CONDITIONS, ST. LOUIS HARBOR, MISSISSIPPI RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco.
Available from NTIS, Springfield, Va 22151 as AD-752 421, Price $3.00 printed copy, $1.45 microfiche. Technical Report H-72-7, November 1972. 56 p, 1 fig, 34 plate.

Descriptors: *Harbors, *Navigation, *Channel improvement, *Mississippi River, *Missouri, Model studies, Shoals, Engineering structures, Design criteria, Channel morphology, Water control, Depth, Locks, Dams.
Identifiers: *St. Louis (Mo), Shoaling, Harbor improvement.

Difficulties encountered during low-flow periods of the Mississippi River in the vicinity of St. Louis, Mo., led to the authorization of studies to determine the advisability of providing improved, commercial harbor facilities. The purposes of the model study were to determine the causes of the shoaling in the harbor and docking areas and to develop plans that could be used to eliminate or reduce shoaling in these areas and in the lower entrance to the Chain of Rocks Canal. The model used was of the movable-bed type, constructed to scales of 1:250 horizontal and 1:100 vertical and reproducing the reach of the Mississippi River and adjacent overbank areas between miles 191.0 and 169.9. Improvement in the conditions along the city front can be obtained by closing the channel along the left side of Mosenthien Island, by extending training structures into the channel on the right side of Mosenthien Island and the channel along the city front, and by constructing a lock and dam structure downstream of the harbor area. (Woodard-USGS)
W73-11856

DETERMINING THE BEST SIZES OF THE OPEN CUT CANALS USED IN HYDROAMELIORATIONS,
For primary bibliographic entry see Field 06A.
W73-11870

A MODEL OF SEASONAL CHANGES IN TOTAL NITROGEN CONCENTRATION IN THE LAKE WINGRA WATER COLUMN,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
E. H. Dettmann.
Available from NTIS, Springfield, Va., as EDFB-IBP-72-12; $4.00 in paper copy, $1.45 microfiche. Report EDFB-IBP-72-12, May 1973. 32 p, 12 fig, 17 ref.

Descriptors: *Nitrogen cycle, *Nitrogen fixation, *Aquatic environment, *Lakes, Mathematical models, Forecasting, Seasonal, Sedimentation, Aquatic bacteria, Nitrogen fixing bacteria, Algae, Balance of nature, Limiting factors, Cycling nutrients.
Identifiers: Lake Wingra (Wis).

The seasonal variation in the N content of lake water was modelled. The feedback loop structure determines the time of two maxima predicted by the model. Feedback control on hydrologic N export limits the maximum occurring in late winter. The time of the summer maximum is predicted too early, possibly because of an inaccurate determination of the N sedimentation rate, neglect of the effect of macrophytes, or denitrification processes in the water. The importance of remineralization at sediment surfaces suggests further study of aquatic microbial remineralization. Further extensions of the model will permit coupling with modelling of the biomass and of P. (Bopp-ORNL)
W73-11911

RESISTANCE LOSSES IN NONCIRCULAR FLOOD CONTROL CONDUITS AND SLUICES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. G. Cox.
Available from NTIS, Springfield, Va 22151 AD-755-821 Price $3.00 printed copy; $1.45 microfiche. Miscellaneous Paper H-73-1, January 1973. 18 p, 6 fig, 2 tab, 11 ref.

Descriptors: *Pipe flow, *Closed conduit flow, *Roughness (Hydraulic), *Head loss, *Energy dissipation, Hydraulics, Hydraulic design, Hydrodynamics.

In very smooth and in very rough noncircular conduits, conduit cross-section shape has a large effect on fluid flow resistance losses. The conduit shapes normally encountered in Corps of Engineers design of flood control projects were tested. The shape effect in these conduits can be neglected for all practical purposes. Also the concept of equivalent hydraulic diameter can be used with confidence for rectangular conduits having aspect ratios (height to width) between 0.5 and 2. (Knapp-USGS)
W73-12027

HYDRAULIC NETWORK ANALYSIS USING LINEAR THEORY,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-12041

POTENTIAL RESERVOIR SITES FOR WATER SUPPLY IN ALABAMA, A PROGRESS REPORT,
Geological Survey of Alabama, University.
L. B. Peirce, and W. E. Smith.
Available from NTIS, Springfield Va. 22151 as PB-213 869 Price $3.00 printed copy; $1.45 microfiche. Preliminary Report, April 1972. 28 p, 2 fig, 1 tab, 5 ref. ADO WRP-71-3.

Descriptors: *Reservoir sites, *Pre-impoundment, *Alabama, *Water supply, Investigations, Projections, Evaluation, Topography, Geology, Hydrology, Drainage area, Streamflow, Water yield, Dams, Design criteria, Water storage, Groundwater resources, Economics, Surface waters.
Identifiers: *Potential reservoir sites (Alabama).

Projections of water requirements in Alabama to the year 2020 indicate that the total commitment for water supply will be approximately 7 bgd greater than in 1970. An increase of this magnitude in the dependable water supply will necessitate a substantial further development of the State's water resources. An awareness of the locations and general characteristics of sites for water-supply reservoirs is a prerequisite in the formulation of any long-range plan for the integrated development of Alabama's land and water resources. Such knowledge is necessary in order that alternative uses of potential reservoir sites, either as land areas or as water areas can be recognized and the relative benefits compared. For example, is a potential reservoir site more beneficially used as a reservoir or as farmland, a wildlife refuge, or an industrial park. Or, if water supply is clearly the need and a potential reservoir site is available, will the reservoir offer advantages over a groundwater supply that might also be available. The inventory of potential reservoir sites was begun in June 1971. (Woodard-USGS)
W73-12073

ENVIRONMENTAL GUIDE FOR THE U.S. GULF COAST,
National Climatic Center, Ashville, N.C.
For primary bibliographic entry see Field 06G.
W73-12310

8C. Hydraulic Machinery

SONIC CAVITATION STUDIES ON MODEL AND PROTOTYPE WATER TURBINES,
Hydro-Electric Commission, Tasmania.
G. J. Causon.
Inst Eng, Aust, Mech Cham Eng Trans, Vol MC8, No 1, p 24-30, May 1972. 13 fig, 1 tab, 10 ref.

Descriptors: *Cavitation, *Hydraulic turbines, *Francis turbines, *Bubbles, *Collapse, Model studies, Prototype tests, Turbine blades, Turbine runners, Laboratory tests, Frequency, Hydraulic machinery, Sound waves, On-site tests.
Identifiers: *Kaplan turbines, Sonic pickups, Frequency characteristics, Specific speed, Air bubbles, Correlation, Accuracy, Vacuum, Turbine efficiency, Test results.

To assess cavitation, sonic tests on models and prototype of both Francis and Kaplin turbines were performed and compared. Sonic measurements are shown to reflect accurately the onset of cavitation and, therefore, are more useful than conventional measurements of efficiency. The characteristic frequency of cavitation and its changing form with reduced suction conditions are discussed in terms of both model and prototype tests. Good correlation was obtained between model and prototype tests, confirming adequacy of the similarity laws applied. An increase in sound level can accurately fix inception of cavitation in both model and prototype turbines. The tests indicate very small changes in sound level occur between very high cavitation coefficient values and the cavitation coefficient value just before onset of cavitation. (USBR)
W73-11720

THE SPARKING OF LIGHTNING ARRESTERS DUE TO CONDUCTIVE CONTAMINANTS,
Iowa State Univ., Ames.
E. Nasser.
Journal of the Franklin Institute, Vol 294, No 6, p 469-481, Dec 1972. 7 fig, 9 ref.

Descriptors: *Lightning arresters, *Flashover, Laboratory tests, Electrical impedance, Electrical resistance, Electrical equipment, Surges.
Identifiers: *Contaminants, *Valves (Electrical), *Breakdown, *Protection (Electrical), Lightning protection, Lightning surges, Electrical insulation, Sparks, Wet condition, Leakage current, Spark gaps, High voltage, Overvoltage, Transients, Electric discharges, Contamination, Test results.

Overvoltage protection valves and lightning arresters are used in a variety of electrical systems ranging from communication to power, and from sea level to high altitude application. When a transient over-voltage occurs, these devices must conduct the excessive charge to ground, thereby protecting valuable network elements from damage by the transient overvoltage. Flawless operation of these devices is required for reliability of any electrical system. Study of lightning arrester performance under the effects of conductive surface contaminants reveals deterioration of the sparking threshold. Under certain conditions, partial sparking has occurred intermittently but persistently, sometimes causing failure of the arrester because of insulation breakdown. This phenomenon was analyzed using nonlineaar characteristics of different types of gas discharges both within the arrester and the contaminant. The arrester was represented by 4 different models depending on mode of operation. Quantitive data were obtained on the percentage threshold drop of a particular arrester caused by a severe contaminant. Test results are presented. (USBR)
W73-11722

THE EFFECT OF VALVE AREA GAIN ON THE PERFORMANCE OF THE HYDRAULIC SERVOMECHANISM,
Trent Polytechnic, Nottingham (England).
J. Montgomery, and H. R. Martin.
Paper 72-WA/Flcs-7, ASME Winter Annual Meeting, New York, NY, Nov 1972. 6 p, 9 fig, 13 ref.

Descriptors: *Orifices, *Valves, Hydraulic machinery, Control systems, Mechanical engineering, Frequency, Cavitation, Performance, Model studies, Stability, Computer models, Pressure, Viscosity, Friction, Flow control, Automatic control.
Identifiers: *Fluidics, *Servomechanics, *Fluid flow, Amplitude, Peak valves, Damping.

In the theoretical analysis of the hydraulic servomechanism a decision has to be made whether to model rectangular or circular ports in the spool valve. This investigation shows that unless the stability of the system is to be analyzed, modeling circular orifices is a complication that can be avoided because: (1) choice of orifice affects the amplitude response only when the inertia load factor is low and then only at low frequencies; (2) peak pressure is affected only when the inertia load factor is high and then only in the midfrequency range; (3) choice of the orifice does not affect the cavitation performance; (4) a circular orifice provides a more stable system than a rectangular orifice; and (5) a rectangular orifice gives a much better small amplitude response. (USBR)
W73-11723

A SURVEY OF LARGE PERMANENT UNDERGROUND OPENINGS IN NORWAY,
Norges Tekniske Hoegskole, Trondheim.
For primary bibliographic entry see Field 08E.
W73-11724

THE REVIN PUMPED-STORAGE PLANT,
Electricite de France, Paris.
P. R. Gerard.
Water Power, Vol 24, No 11, p 411-418, Nov 1972. 7 fig, 4 photo.

Descriptors: *Pumped storage, *Underground powerplants, *Peak power, Reversible turbines, Pump turbines, Reservoirs, Earth dams, Tunnels, Penstocks, Construction costs, Construction materials, Foreign projects, Tunnel linings, Hydraulic machinery, Geology.
Identifiers: *Hydroelectric powerplants, France, Spherical valves, Electric machinery, Peaking capacities, Intake structures, Foreign construction.

The Revin plant, a 760-mw pumped storage plant being built in the Ardennes in France to furnish 180-km daily peaking power to Paris, is described. This plant, when completed, will be the third largest pumped storage plant in the Belgium-Luxembourg-France area. The project is comprised of a hilltop upper basin having an area of 700,000 sq m; a lower reservoir formed by an earthfill dam across the Faux River; and an underground powerplant, housing four 190-mw, 0.9-pf, single-stage reversible-pump turbine units, each with a spherical valve in its penstock. The units have a vertical shaft arrangement designed to operate over a net head ranging from 212 to 250 m at 300 rpm. The upper reservoir provides storage for 5 hrs of generation at full capacity, and will require 7-1/2 hrs in the pumping mode to refill. To start the units in the pumping mode, a conventional pony motor and compressed air dewatering will be used on 3 units with the fourth unit being started as an asynchronous motor at full voltage. Full-scale construction on the project began in 1970; the firts unit to be in service by the end of 1973, and the remaining 3 by the end of 1974. (USBR)
W73-11726

THE DYNAMICS AND CONTROL OF EULERIAN TURBOMACHINES,
Massachusetts Inst. of Tech., Cambridge.
H. M. Paynter.
Paper 72-Aut-S, Trans Am Soc Mech Eng, Ser G--J Dyn Syst Meas Control, May 1972. 8p, 13 fig, 1 tab, 11 ref.

Descriptors: *Hydraulic machinery, *Hydraulic turbines, *Fluid mechanics, *Control, Pumps, Dynamics, Energy conversion, Pump turbines, Governors, Pulsating flow, Model studies, Reynolds number, Turbine blades, Mechanical control.
Identifiers: *Fluid dynamics, Eulers Equation of Motion, Transients, Wicket gates, Transducers.

An efficient turbomachine (fan, blower, compressor, pump, propeller, or turbine) represents an energy converter or transducer basically gyrational in character. A 2-port gyrator operating in conjunction with a 2-port dissipator can represent the static characteristics of any real machine. This model is further simplified if the machine satisfies Eulerian similitude. If an Eulerian turbomachine is controlled or modulated by movable guidevanes or wicket gates, the necessary fluid-dynamical reaction forces on the gates are constrained by energy couplings directly related to the energy conversion process through the machine. A systematic approach given demonstrates the underlying theory of Eulerian turbomachines and yields rational structured bond graph models useful in dynamics and control studies. These models also provide effective design and operating information for major engineering systems. (USBR)
W73-11731

SHIELD TUNNELLING WITH LINER PLATES,
Wayss und Freytag KG, Frankfurt-am-Main (West Germany).
For primary bibliographic entry see Field 08A.
W73-11732

AN UNDERGROUND STORAGE RESERVOIR AS AN ARTIFICIAL STRUCTURE,
Energoprojekt, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 08A.
W73-11741

OPTIMAL GATE CLOSURE SCHEDULE FOR HYDROELECTRIC TURBINE SYSTEM,
Illinois Univ., Urbana.
L. Woziak, and G. H. Fett.
Paper No 72-WA/Fe-23, Trans Am Soc Mech Eng, Ser D--J Basic Eng, Winter Annual Meeting, New York, NY, Nov 1972. 6 p, 5 fig, 16 ref, 2 append.

Descriptors: *Water hammer, Electric power, *Hydraulic turbines, *Governors, *Optimization, Gate control, Penstocks, Computers, Hydraulic machinery, Bibliographies, Hydroelectric powerplants, *Gates, Computer programs, Transient flow.
Identifiers: Overspeed, *Wicket gates, *Closures.

With the National demand for electric energy predicted to double every 10 yrs and with the development of interconnected networks, the requirements in system design for quality of transient behavior have become increasingly more stringent. Advances in computer technology within the last decade have made possible comprehensive simulations on a non-linear basis. A procedure is presented for the generation of an optimal gate closure schedule for the case of full load rejection on an isolated hydroelectric system. Constraints are placed on turbine overspeed and penstock overpressure. The optimization is performed on the basis of minimum integral square of the speed error and implemented digitally by the method of steepset descent. The computation indicates that a substantial performance improvement is achieved with optimal control as opposed to the conventional. The index of performance has a relative value of 1.58 for the optimal strategy. The best solution for the conventional speed governed case was 2.20. (USBR)
W73-11742

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF MAINE YANKEE ATOMIC POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11899

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF ZION NUCLEAR POWER STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11900

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SURRY POWER STATION UNIT 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11903

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF KEWAUNEE NUCLEAR POWER PLANT.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11904

REPORT ON RELEASES OF RADIOACTIVITY IN EFFLUENTS FROM NUCLEAR POWER PLANTS FOR 1971.
Directorate of Regulatory Operations (AEC), Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-11905

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF FORT CALHOUN STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11906

SOME FEATURES OF THE IMPACT OF A FUSION REACTOR POWER PLANT ON THE ENVIRONMENT,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-11910

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE ARKANSAS NUCLEAR ONE UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11913

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED HANFORD NUMBER TWO NUCLEAR POWER PLANT.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11917

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF DAVIS-BESSE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11920

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1972,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05A.
W73-11924

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF SHEARON HARRIS NUCLEAR POWER PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing, (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11926

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CRYSTAL RIVER UNIT 3.
Atomic Energy Commission, Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11927

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF PILGRIM NUCLEAR POWER STATION.
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11928

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF JOSEPH M. FARLEY NUCLEAR PLANT UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11931

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF VERMONT YANKEE NUCLEAR POWER STATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11932

8D. Soil Mechanics

BEARING CAPACITY THEORY FROM EXPERIMENTAL RESULTS,
Indian Inst. of Tech., Kharagpur.
A. V. Chummar.
J Soil Mech Found Div, Am Soc Civ Eng, Vol 98, No SM12, p 1311-1324, Dec 1972. 9 fig, 1 tab, 12 ref, 2 append.

Descriptors: *Foundations, Laboratory tests, Cohesionless soils, Soil mechanics, Foundation bearing tests, Structural stability, Foundation failure, Shear strength, Theoretical analysis, Strain, Failure (Mechanics), Model studies.
Identifiers: *Bearing capacity, Continuous footings, Plane strain, Footings, Mathematical analysis, Comparative studies, Bearing values, Failure surfaces.

A theory of bearing capacity of strip footings on cohesionless soils is developed, based on a failure surface deduced from experimentally observed surfaces. Conclusions are: (1) Existing theories on bearing capacity are based on failure surfaces, whose size and shape are different from those observed in experiments. In dense sands the observed surfaces are much smaller than those assumed in theories. (2) For long footings where plane-strain conditions prevail, commonly used theories fail to accurately predict bearing capacity. (3) Bearing capacity equations based on a failure surface deduced from the experimentally observed surfaces predict the bearing capacity of long footings accurately when the plane-strain value of the friction angle is taken as 1.1 times the triaxial test value. (4) The failure surface deduced from experimentally observed surfaces is different from those assumed in existing theories. The deduced surface comprises circular and plane surfaces, the plane surface making an angle close to 45 deg with the horizontal. Equations for calculating bearing capacity are presented. (USBR)
W73-11718

BASIC RELATIONSHIPS AFFECTING THE PLANNING OF SINGLE-PHASE CHEMICAL GROUND STABILIZATION,
For primary bibliographic entry see Field 08G.
W73-11729

CENTRIFUGE TESTING FOR MODELS OF SOIL STRUCTURES,
Canterbury Univ., Christchurch (New Zealand).
T. A. H. Dodd.
N Z Eng, Vol 27, No 9, p 286-290, Sept 15 1972. 1 fig, 1 photo, 7 ref.

Descriptors: Soil tests, *Centrifugation, Soil mechanics, Laboratory equipment, Earth dams, Pore pressure, Slope stability, Embankments, Consolidation, Tunnels, Model studies.
Identifiers: Japan, Great Britain, Centrifuges, Bearing capacity, *Similitude.

Substantial savings are expected in the cost of designing dams and other earth structures by using centrifuge models rather than conventional laboratory strength and consolidation soil tests. Centrifuge models are based on 2 laws of similarity for soil models: (1) If a gravity-affected soil prototype is modeled in identical soil to a scale of 1/N and this model is subjected to gravitational force of N times that experienced by the prototype, then, provided that the stresses at the boundaries of the model and the prototype are also to scale, the model will behave, to scale, exactly the same as the prototype. (2) Provided the above boundary conditions are satisfied, than any time dependence in the response of the prototype to the applied stress is speeded up in the model by a factor of N squared, provided secondary consolidation can be ignored. Of the centrifuge machines built in Britain and Japan, the largest is capable of accelerating to 200 g; model size range up to 0.6 m high and 1.2 by 2.0 m in plan. Tests performed include: (1) earth dam stability under drawdown, (2) tunnel section deformation, (3) embankment settlement, (4) foundation bearing capacity, and (5) slope stability. (USBR)
W73-11745

BREVARD COUNTY BEACH EROSION CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08A.
W73-11997

8E. Rock Mechanics and Geology

A SURVEY OF LARGE PERMANENT UNDERGROUND OPENINGS IN NORWAY,
Norges Tekniske Hoegskole, Trondheim.
T. L. Brekke.
Paper, Int Symp Large Perm Underground Openings, Oslo, Norway, Sep 1969, p 15-28, 1970. 11 fig, 29 ref.

Descriptors: *Underground powerplants, Geologic investigations, *Underground structures, *Engineering geology, Rock excavation, Rock mechanics, Geology, Rock tests, Education, Rock properties, Expansive clays, Bibliographies, Costs.
Identifiers: *Underground openings, *Tunnel supports, Norway, Hydroelectric powerplants, Unlined tunnels, Foreign construction, Rock pressure.

Construction of underground structures in Norway has been encouraged by favorable natural conditions--generally no more than 5% of a Norwegian underground project is lined or systematically reinforced. The most important underground structures are 110 hydropowerplants. These plants, some with pressure heads of over 1,000 m, provide 75% of the country's electric power. Underground plants were found to be more economical than those in the open, leading to better utilization of available heads, greater flexibility in site choice, shorter pipelines, simplified construction details, year-round construction, and reduced maintenance and repair costs. Low excavation costs, mainly using percussive drilling, greatly influence the economy. Laboratory tests were developed to predict rock indexes for percussive drilling rate, bit wear, and blasting resistance. Important factors causing underground stability problems are: (1) unfavorable directions and combinations of faults, joints, and fissures; (2) rock pressure; and (3) swelling montmorillonite clay. For site investigations, less core drilling is done in Norway than elsewhere. Savings have been realized because the parties involved are willing to reconsider the site, orientation, and design during the construction period. (USBR)
W73-11724

COUPLED STRESS AND FLOW ANALYSIS OF FRACTURED DAM FOUNDATIONS AND ROCK SLOPES,
California Univ., Berkeley.
T. L. Brekke.
Paper, Symp Int Soc Rock Mech: Percolation Through Fissured Rock, Stuttgart, Germany, Sept 1972. 8 p, 12 fig, 3 tab, 11 ref.

Descriptors: *Dam foundations, *Rock foundations, *Seepage, Fractures (Geology), Stress analysis, Finite element method, Joints (Geologic), Uplift pressure, Grouting, Flow nets, Grout curtains, Phreatic lines, Seepage control, Rock mechanics, Water pressure, Fluid flow.
Identifiers: *Rock foundations, Rock slope, Fluid force, Mathematical analysis, Toe drains, Underground openings.

An analytical method is presented that considers the interaction between flow forces, body forces, and boundary loads in fractured rock masses. Although some methods mathematically model a fractured rock mass as a continuum or a rigid discontinuum, the model for this method is a deformable discontinuum whose fractures can change size depending on the stress conditions. In studying the foundation for a gravity dam, 2 finite element techniques and a converging iteration process are used. Steps to be followed are: (1) determine the effect of the structure on the rock mass stress distribution and fracture openings; (2) determine approximate fluid pressures using fracture openings calculated in step (1); (3) determine new fracture openings considering effect of structure and fluid pressures calculated in step (2); (4) recalculate fluid pressure using fracture openings determined in step (3); and (5) iteration of steps (3) and (4) until the changes in fluid pressure are satisfactorily small. Examples using this coupled stress-flow procedure are presented for a gravity dam with 3 different foundation conditions: untreated, grouted, and drained. Results using this method are simetimes considerably different than results using a rigid discontinuum. (USBR)
W73-11730

8F. Concrete

CONTROL OF CRACKING IN CONCRETE STRUCTURES,
American Concrete Inst., Detroit, Mich. Committee 224.

Journal of the American Concrete Institute, Proceedings, Vol 69, No 12, p 717-753, Dec 1972. 20 fig, 5 tab, 94 ref, append.

Descriptors: *Concretes, *Concrete technology, Concrete construction, Structural design, Concrete structures, Concrete control, Reinforced concrete, Prestressed concrete, Creep, Mass concrete, Strain, Stress, Cracks, Shrinkage, Aggregates, Expansion, Bibliographies, Criteria, Slabs.
Identifiers: *Crack control, *Cracking, Microcracks, Concrete properties, Heat of hydration, Volume change, Criteria.

With the widespread use of high-strength steels and the trend toward ultimate load and limit theory designs, control of cracking in reinforced concrete structures becomes very important. To help engineers exercise better judgment in designing crack-controlled structures, a comprehensive report on the principal causes of cracking and recommended crack control provisions is presented. The basic mechanism of microcracking and fracture mechanics in concrete is explained. Presented are quantitative recommendations for control of cracking due to drying shrinkage, control of flexural cracking, and crack control in prestressed concrete. Effects of long-term loading and exposure are described. Specific recommendations for control of cracks in mass concrete include details of an embedded pipe cooling system. Control of construction practices which cause or facilitate cracking are discussed. (USBR)
W73-11728

DEFLECTIONS OF PRESTRESSED CONCRETE BRIDGES IN JAPAN,
Tokyo Univ. (Japan).
M. Kokubu.
Mag Concr Res, Vol 24, No 80, p 117-126, September 1972. 10 fig, 3 tab, 12 ref.

Descriptors: *Deflection, *Bridge design, Prestressed concrete, Concrete structures, Structural behavior, Cantilevers, Structural analysis, Measurement, Strain, Creep, Shrinkage, Seismic design, Structural design, Earthquake engineering, Concrete mixes.
Identifiers: *Highway bridges, *Railroad bridges, Carlson strain meter, Foreign design practices.

Deflections measured in 5 prestressed concrete bridges in Japan are summarized and discussed. The bridges are long span, hinged at the center, and constructed by the cantilever method. Measured values were compared with values calculated by a simplified deflection formula after the hinges were joined. Despite many factors that could be considered when calculating bridge deflections, fairly good agreement with measured values was obtained by assuming a drying shrinkage strain in concrete of 0.000150 and a creep coefficient of 2.0 over the entire length of the beam. Deflections that may be expected when bridges of the continous type are subjected to seismic forces and designs to cope with these conditions are discussed. To confirm the degree of safety of important bridges, dynamic analyses were made. Natural frequencies determined from vibration tests did not differ greatly from calculated values. A practical method to dampen horizontal seismic forces at each pier using steel dowels is described. (USBR)
W73-11735

CONDITIONS FOR INSTABILITY IN RESTRAINED CONCRETE PANELS EXPOSED TO FIRE,
London Univ. (England).
J. W. Dougill.
Mag Concr Res, Vol 24, No 80, p 139-148, Sept 1972. 1 tab, 11 ref.

Descriptors: *Concrete technology, *Spalling, *Thermal stress, Concretes, Stress, Strain, Heat, Pore pressure, Tensile stress, Numerical analysis, Walls, Computer models, Failure, Concrete structures, Temperature.
Identifiers: *High temperature, *Spalling, *Thermal spalling, Fire safety, Compressive stress, Stress-strain curves, Panels, Cracking, Fires, Calculations.

Instabilities associated with general spalling of plain concrete panels were investigated to obtain a thermal history similar to that obtained in a standard fire test. Results illustrate the effects of flexural restraint and loading of the panels upon the occurrence of general spalling. These effects are important in assessing the performance of structures exposed to fire. Behavior of a heated panel was influenced by the extent of cracking caused by tensile stress, and by the steepness of the descending branch of the stress-strain curve in compression. The first of these effects may have important implications because using large quantities of reinforcing steel in heated panels may transform progressive compression failure, controlled by cracking, to a violent one. The second effect is more difficult to assess, but strain softening may become more serious because of a modest amount of pore pressure in the concrete. Production of steam in the concrete at high temperatures could increase general spalling. (USBR)
W73-11739

THE HENDRIK VERWOERD DAM OF THE ORANGE RIVER PROJECT, SOUTH AFRICA.
South African Embassy, London (England).
For primary bibliographic entry see Field 08A.
W73-11740

METHODS FOR SAMPLING AND DETERMINING SIEVE ANALYSIS OF AGGREGATES LARGER THAN ONE AND ONE-HALF INCH SIEVE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. L. Curry, R. E. Philleo, and B. Mather.
Available from NTIS, Springfield 22151 as AD-751 104. Price $3.00 printed copy; $1.45 microfiche. Technical Report No 6-543, May 1960. 30 p, 1 fig, 5 tab, 8 ref.

Descriptors: *Sieve analysis, *Aggregates, *Particle size, *Coarse aggregates, Separation techniques, Correlation analysis, Evaluation, Hydraulic structures, Concrete technology, Construction materials, Engineering structures.

Sampling of concrete aggregates larger than the 1-1/2 inch sieve poses special problems due to difficulties encountered in handling and shoveling crushed stone and gravel of large maximum size and the large amount of material required per sample. Methods of sampling tested were grab sampling with a clamshell from the stockpile, trench sampling from trucks loaded with the aggregate, belt sampling while aggregate was being loaded into a storage bin, and grab sampling of materials being discharged from bin storage. Comparative sieve analyses were made of samples of both 1-1/2- to 3- inch and 3- to 6-inch size ranges. The general conclusions were that any of the sampling methods would be satisfactory; that 100-lb samples of 1-1/2 to 2-inch aggregate and 300-lb samples of 3-to 6-inch aggregate would be large enough; that diameter of wire in the 5- and 6-inch sieves should be approximately 0.360 to 0.530 inch, and that hand-sieving of aggregates coarser than the 3-inch sieve may be satisfactorily accomplished. (Woodard-USGS)
W73-12070

8G. Materials

BEARING CAPACITY THEORY FROM EXPERIMENTAL RESULTS,
Indian Inst. of Tech., Kharagpur.
For primary bibliographic entry see Field 08D.
W73-11718

SONIC CAVITATION STUDIES ON MODEL AND PROTOTYPE WATER TURBINES,
Hydro-Electric Commission, Tasmania.
For primary bibliographic entry see Field 08C.
W73-11720

PROCEDURES FOR EVALUATION OF FRACTURE TOUGHNESS OF HEAT-AFFECTED ZONES,
Lafayette Coll., Easton, Pa.
L. J. McGeady.
Weld J, Vol 51, No 12, p 569-s-578-s, Dec 1972. 12 fig, 7 tab, 11 ref.

Descriptors: *Welding, Mechanical engineering, Fabriaction, Failure (Mechanics), Yield strength, Mechanical properties, Strength of materials, Ductility, Steel plates.
Identifiers: *Weldments, *Toughness, *Fractures, *Metal test, Fracture mechanics, Cracking, Critical depth, Tensile properties, Welds, Material test.

A good quality weld requires adequate fracture toughness of base metal, weld metal, and heat-affected zone (HAZ). Inadequate toughness in any area is a threat to structural integrity. Reliable methods of evaluating fracture toughness in the base metal or the weld metal are available, but HAZ toughness evaluation has posed experimental problems and are discussed in this paper. The Drop-Weight (DW) and Dynamic Tear (DT) tests have been widely used to characterize plate and weld metal toughness separately and quantitatively. Data presented demonstrate that these 2 procedures can be applied to HAZ toughness. Results of composite specimen tests and single component tests agree well when applied to several steels. Successful characterization of HAZ toughness using the DW and DT procedures provides quantitative reference data for use in the Fracture Analysis and Ratio Analysis Diagrams. Information from practical test methods is necessary in defining appropriate welding parameters for specific steels. (USBR)
W73-11721

MECHANISMS OF ENERGY ABSORPTION IN SPEICAL DEVISES FOR USE IN EARTHQUAKE RESISTANT STRUCTURES,
California Univ., Berkeley.
For primary bibliographic entry see Field 08A.
W73-11725

BASIC RELATIONSHIPS AFFECTING THE PLANNING OF SINGLE-PHASE CHEMICAL GROUND STABILIZATION,
G. Greschik.
Symp Prot Underground Build Against Water, Bratislava, Czechoslovakia, p 97-104, Sept 1972. Transl from German, Bur Reclam Transl 884, Dec 1972. 11 p, 7 fig.

Descriptors: *Soil stabilization, Chemical properties, Stabilization, Grouting, Costs, Optimization, Gels, Viscosity, Chemical engineering, Soil mechanics, Chemistry, Strength.
Identifiers: *Chemical grouts, *Sodium silicate, Grout mixes, Chemical compounds, Grouting pressure, Setting (Materials).

Stabilizing ground chemically involves an optimization of both the chemical injection process and the chemical mixture composition. The 2 optimization tasks are linked by the viscosity and setting time of the chemical mixture. The chemical injection process can be solved, after evaluating the ground conditions, with the aid of Maag's or Haefeli's equations, but determining the optimum chemical mixture is usually more difficult. Principal properties of an injection material or gel are the viscosity, setting time, strength, and cost. The chemical components of the injection mixture tested, whose quantity and temperature determine the properties of the mixture, are sodium silicate, a precipitant, and water. Triangular diagrams are presented giving the setting time, initial viscosity, strength, and cost for mixtures with all possible percentages of sodium silicate, precipant, and water. Using the maximum initial viscosity and minimum setting time values calculated for the chemical injection process, the triangular diagrams can be used to determine a chemical mixture with satisfactory strength and economy. (USBR)
W73-11729

APPLICATION OF CATHODIC PROTECTION,
Texas Eastern Transmission Corp., Shreveport, La.
D. A. Tefankjian.
Mater Prot Performance, Vol 11, No 11, p 50-60, November 1972. 5 fig, 4 tab.

Descriptors: *Cathodic protection, *Corrosion control, *Corrosion, Pipelines, Cathodes, Anodes, Electrolysis, Rectifiers, Protective coatings.
Identifiers: *Buried pipes, *Buried structures, Galvanic protection systems, Buried metalwork, Ground currents, Corrosion currents, Electric potential, Galvanic corrosion, Soil resistivity, Underground corrosion, Protection (Electrical).

As the number of underground structures increases, corrosion becomes more as a problem. The rising cost of repairs and replacements for these structures necessitates an increasing demand for corrosion protection methods. Corrosion control practices, such as the application of cathodic protection and protective coatings, and improved metallurgical techniques are becoming more important. The principles involved, the methods used, and design factors for applying cathodic protection are discussed. Cathodic protection consists of making the potential of the soil contacting the buried structure positive so corrosion currents can no longer leave the metal surface. The higher intensity protective currents enter the structure and are drained away by a metallic circuit at a controlled point. If electric currents are kept from leaving the buried structure electrolytically, corrosion is arrested. (USBR)
W73-11736

RESPONSIBLE WELD DESIGN,
Lincoln Electric Co., Inc., Cleveland, Ohio.
O. W. Blodgett.
Weld J, Vol 52, No 1, p 13-21, Jan 1973. 20 fig, 1 tab.

Descriptors: *Welded joints, *Welding, Design, Fabrication, Costs, Stress, Joints (Connections), Steel structures.
Identifiers: *Weldments, Butt welds, *Welds, Butt joints, Fillet welds.

Perhaps in no other field is responsible performance more important to the end product than in weldment design. An expert weldment designer can design welds that will meet all service requirements and yet be lacking in responsible performance because of excessive production costs. A weldment designer is not doing a responsible job unless the design is economical, practicable in production, and workable in service. The experienced, responsible weldment design engineer must know--how welds will be produced, how material will be cut, and how assemblies will be put together. He should have a casual acquaintance with every operation in production. To promote best use of welding the designer minimizes the amount of weld metal to be deposited--thereby proving welding as a method of joining that maintains the full strength of the materials. Twelve shortcomings that produce irresponsible design are discussed. (USBR)
W73-11743

CENTRIFUGE TESTING FOR MODELS OF SOIL STRUCTURES,
Canterbury Univ., Christchurch (New Zealand).
For primary bibliographic entry see Field 08D.
W73-11745

SCALE INHIBITION BY ORGANIC ELECTRODEPOSITION,
Tyco Labs, Inc., Waltham, Mass.
L. Nelsen, and A. H. Taylor.
Available from the National Technical Information Service as PB-218 833, $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Research and Development Progress Reports No 835, August 1972. 62 p, 11 fig, 12 tab. 14-30-2856.

Descriptors: *Scaling, *Heat exchangers, Inhibition, Evaporators, Crystallization, Calcium sulfate.
Identifiers: Ultra-thin layers, Organic electrodeposition.

A research program to inhibit the formation of calcium sulfate anhydrate scale on heat exchangers of evaporative desalination plants was carried out. In this study ultra-thin layers of organic materials were deposited on heated metallic surfaces by means of controlled electrical potentials. The organics studied included polymers and low molecular weight organic compounds. Both types of coatings resulted in significant reduction in scale. The studies suggest that the deposited layers provided a passivation of the surface preventing scale nucleation. (OSW)
W73-11751

8H. Rapid Excavation

NEW CONTINUOUS-FLOW PROCESS FOR BLAST-HOLE DRILLING IN HYDRAULIC-ENGINEERING, RECLAMATION, AND WATER--RESOURCES CONSTRUCTION,
Severyni Nauchno-Issledoatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
D. M. Drushnarev, and A. N. Patrashev.
Cent Lab Reclam Hydraul-Eng Blasting. Res North Sci-Res Inst Hydraul Eng Reclam, 10 p, Moscow, 1971. Transl from Russ, Bur Reclam Transl 880, Nov 1972. 9 p, 7 fig.

Descriptors: *Canals, *Explosives, *Explosive construction, *Cold weather construction, Frozen soils, Pipes, Plastic pipes, Boreholes, Polyethylene, Foreign construction, Foreign tests.
Identifiers: *Cylindrical charges, *Explosive excavation, *Explosive construction, *Rapid excavation, *Construction methods, Depth of burst, Charges (Explosives), Blasting, Fuses (Explosions), Foreign activities.

Because canal excavation by the conventional explosive method is not uniform, a new method of using a continuous horizontal explosive charge has been developed. In soft soils, 250 to 300 m of flexible polyethylene, high-pressure pipe filled with granular explosive is place automatically at a predetermined depth by a special tractor. Before the explosive is detonated, the buried charge is compacted. A narrow trench, 30 to 40 cm deep, is cut on both sides of the centerline at the design width of the canal. The resulting canal created by a single explosion is fairly uniform. In forzen soil, a narrow trench is excavated and a continuous charge placed simultaneously at the bottom of the trench, enabling the soil to be excavated 10 times faster than by conventional earthmoving machines. Other advantages of this method are: (1) Fewer fuses and detonators are required; (2) only 1/3 the usual amount of explosive charge is required; and (3) earthwork productivity is 400% higher. A curve is included showing the depth and amount of charge required to excavate canals with different cross sections. (USBR)
W73-11733

8I. Fisheries Engineering

INTRODUCTION OF KOKANEE SALMON (ONCORHYNCHUSNERKA) INTO LAKE HURON,
Department of Lands and Forests, South Baymouth (Ontario). Research Branch.
J. J. Collins.
J Fish Res Board Can. Vol 28, No 12, p 1857-1871. 1972. Illus.
Identifiers: Alewife, Canada, DDT, Food, Insects, *Kokanee salmon, Lakes, Oncorhynchus-Nerka, Plankton, Salmon, Spawning, *Lake Huron.

An experimental introduction of O. nerka into Lake Huron from egg stocks obtained from British Columbia and several western USA states began in 1964. From 1964-1969, about 5.5 million kokanee (eggs, fry, and fingerlings) were planted. Estimated minimum returns of adults were 9000, 1200, and 4000 in 1967, 1968, and 1969, respectively. Although most of the returns were recorded near planting sites, substantial numbers moved into other areas, in some instances spawning in streams that were not planted. Apparently, most kokanee matured in their third yr of life (2+) and their lengths ranged from 18-49 cm. The incidence of lamprey marks on adults was light (1.6% of 4472 examined) but frequencies of marks tended to increase as fish size increased -- from 0.5% for 28-32 cm fish to 16.7% for fish over 40 cm long. Successful stream spawning in 1967 was indicated by the retrieval of live eggs and alevins from redds and the capture of downstream migrant fry. Shore spawning was verified by retrieval of viable eggs from redds in 1969. The potential egg deposition in the 2 rivers with the largest runs in 1967 was approximately 2.7 million eggs. Fish from British Columbia river-spawning stock spawned both in streams and along shores of South Bay. Since spawning was not restricted to streams, the shore areas of Lake Huron may extend the spawning habitat available to kokanee. Adult kokanee fed mainly on insects and plankton during Aug. and Sept. Aerial forms of insects predominated in South Bay kokanee. Dieldrin and DDT residues were moderate, averaging between 0.012 and 0.046 ppm for dieldrin and 0.226 and 1.242 ppm for DDT in whole tissue samples. Data from South Bay show that the principal species found in association with kokanee were alewife and smelt. The diet

of alewife in Aug. indicated possible competition with kokanee.h-Copyright 1972, Biological Abstracts, Inc.
W73-11717

OBSERVATIONS ON THE MIGRATION OF SOCKEYE SALMON FRY (ONCORHYNCHUS NERKA) IN THE LOWER BABINE RIVER,
California Univ., Berkeley. Dept. of Zoology.
W. C. Clarke, and H. D. Smith.
J Fish Res Board Can. Vol 29, No 2 p 151-159. 1972. Illus.
Identifiers: *Babine River, *Canada, Fry, Fish migration, Oncorhynchus-Nerka, Rivers, Salmon, *Sockeye salmon fry.

No distinct length, weight, or behavioral differences associated with place of capture in the river were observed, indicating that all fry are susceptible to downstream displacement. A minimum of 7.5 million (18%) of the fry produced passed through a counting fence below the spawning grounds. Others reached quiet waters inshore, where they progressively developed behavioral characteristics that enabled them to ascend the river and reach lake nursery areas above. Two million fry ascended an improvised ladder spanning an area of turbulence at the base of the fence. Construction of leads and baffles at stretagic places below the fence could help fry reach shore sooner and increase numbers reaching the lake.--Copyright 1972, Biological Abstracts, Inc.
W73-11747

FERTILIZATION OF PINK SALMON (ONCORHYNCHUS GORBUSCHA) OVA BY SPERMATOZOA FROM GONADOTROPIN- INJECTED JUVENILES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Vancouver Lab.
E. M. Donaldson, J. D. Funk, F. C. Withler, and R. B. Morley.
J Fish Res Board Can. Vol 29, No 1, p 13-18. 1972. Illus.
Identifiers: Fertilization (Fish), *Gonadotropin spermatozoa, Hormone-Drug, Juveniles, Oncorhynchus-gorbuscha, Oncorhynchus-Tshawytscha, *Pink salmon ova, *Sexual maturation, *Canada (British Columbia).

Sexual maturation in male O. gorbuscha from Jones Creek, a tributary of the Fraser River, British Columbia, was accelerated by intraperitoneal injections of partially purified chinook salmon (O. tshawytscha) gonadotropin. The treated pinks produced milt 1 yr earlier than normal. Milt from these fish was compared with milt from wild lower Babine River pinks with respect to its ability to fertilize the ova of Lower Babine River females. There was no marked differences in proportions of ova fertilized, in survival to hatching, or in numbers of deformed larvae. Densities of sperm in the milt from treated males ranged from 0.15 x 10 to the 9th power to 7.35 x 10 to the 9th power/ml; sperm densities in the milt from wild males ranged from 19.3 x 10 to the 9th power to 38.6 x 10 to the 9th power/ml. Two stages in testicular development were identified among the treated males and found to be directly related to the success of fertilization. The significance of induced early maturation in attempts to establish pink runs in the 'off' year rivers is discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-11866

GROWTH PER MOULT OF TAGGED LOBSTERS (HOMARUS AMERICANUS) IN BONAVISTA BAY, NEWFOUNDLAND,
Fisheries Research Board of Canada, St. John's (Newfoundland). Biological Station.
G. P. Ennis.
J Fish Res Board Can, Vol 29, No 2, p 143-148, 1972, Illus.
Identifiers: Bays, *Bonavista Bay (NF), *Canada (Newfoundland), Growth, Homarus-americanus, *Lobsters, Molt, Tagging.

The suitability of the sphyrion tag for lobster growth studies is demonstrated by comparing growth of ferromagnetic- and sphyrion-tagged lobsters. Carapace length and total weight increments in one molt of 54 males (52-92-mm carapace length) tagged with sphyrion tags averaged 11.4 mm (15.7%) and 185.9 g (60.8%). For 56 females 57-89-mm carapace length they averaged 9.8 mm (13.3%) and 136.3 g (42.5%). Differences in growth per molt between sexes increased with size. For both sexes percent carapace length increment decreased with increase in carapace length but more rapidly for females. Carapace length increment increased with increasing carapace length for males, but for females there was no significant change over the size range considered. Incidence of molting for sphyrion-tagged lobsters was 83.1% and comparable with an observed estimate (82.2%) from field samples obtained shortly after the molting season.--Copyright 1972, Biological Abstracts, Inc.
W73-11914

RECOVERY OF PLANTED BROOK TROUT, SPLAKE, AND RAINBOW TROUT FROM SELECTED ONTARIO LAKES,
Department of Lands and Forests, Maple (Ontario). Research Branch.
J. M. Fraser.
J Fish Res Board Can. Vol 29, No 2, p 129-142. 1972. Illus.
Identifiers: Birds, *Brook trout, Canada (Ontario), Lakes, Predation, *Rainbow trout, Recovery, Salmo-Gairdneri, Salvelinus-Fontinalis, Salvelinus-Namaycush, *Splake, Trout.

Recoveries of hatchery-reared brook trout (Salvelinus fontinalis), splake (Salvelinus namaycush X S. fontinalis), and rainbow trout (Salmo gairdneri), planted in lakes having different resident fishes, were highest (9-30%) in a lake in which minnows and the brook stickleback were the only other fishes. Recoveries, by angling and gillnetting, were considerably lower (2-15%) in 2 lakes containing the white sucker and minnows, and still lower (0.5-5%) in 2 lakes containing spiny-rayed species as well. Recoveries were lowest (<0.5%) in a lake having a complex fish community that included native brook and lake trout. Planted splake and rainbow trout generally yielded higher returns, in weight, than brook trout in comparable situations. The low survival of planted fish was apparently due to the low fertility of the waters and to competition with, or predation by, resident fish species. Predation by fish-eating birds and mammals may also have had an effect. The weight of the catch of salmonids exceeded the weight planted in only 1 lake. Here, the mean yield of planted salmonids was 8.4 kg/ha/hr in comparison with 2.6 to <0.5 kg/ha/yr in the 5 other study lakes.--Copyright 1972, Biological Abstracts, Inc.
W73-11940

A SYNOPTIC STUDY OF FOOD HABITS OF 30 FISH SPECIES FROM WESTERN LAKE SUPERIOR,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 02H.
W73-11959

COASTAL PLAINS REGIONAL COMMISSION--ANNUAL REPORT, 1972.
For primary bibliographic entry see Field 06E.
W73-11974

FERTILIZATION OF STEELHEAD TROUT (SALMO GAIRDNERI) EGGS WITH CRYO--PRESERVED SPERM,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
A. G. Ott, and H. F. Horton.
J Fish Res Board Can. Vol 28, No 12, p 1915-1918. 1972.
Identifiers: *Fertilization (Trout), Salmo-Gairdneri, *Trout sperm (Cryo-perserved), *Steelhead trout, Fish eggs.

The average percent fertilization of fresh S. gairdneri ova inseminated with cryo-preserved sperm was 59 in 90 tests. Sodium bicarbonate, lecithin, and mannitol at 750, 750, and 250 mg/100 ml, respectively, were included in the extender. The most effective concentration of dimethyl sulfoxide in the extender was 12% (v/v). Significant differences in percent of fresh ova fertilized with cryo-preserved sperm were attributed to both parents.--Copyright 1972, Biological Abstracts, Inc.
W73-12129

STUDIES ON CARP CULTURE IN RUNNING WATER POND: IV. ON RELATION BETWEEN DIURNAL CHANGE OF WATER QUALITIES IN THE FISH POND AND DECREASE OF FISH FEEDING (IN JAPANESE),
Freshwater Fisheries Research Lab., Toyko (Japan).
K. Chiba.
Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 1, p 59-68. 1971. Illus. English summary.
Identifiers: *Carp, Culture, Diurnal, Feeding, Fish (Feeding), *Oxygen, Ponds, Running water.

O2 concentration lowered below 50% air saturation was the principal factor of decreased feeding of fish in the running water fishpond. (See also W72-07700)--Copyright 1972, Biological Abstracts, Inc.
W73-12174

HATCHERY REARING OF WALLEYES USING ARTIFICIAL FOOD,
Department of Lands and Forests, Tweed (Ontario).
W. F. Chesire, and K. L. Steele.
Prog Fish-Cult Vol 34, No 2, p 96-99. 1972. Illus.
Identifiers: *Fish diets, Artificial food, Granules, *Hatchery rearing, Trout, *Walleyes.

Walleye were pond reared experimentally at the White Lake Rearing Station in Ontario since 1961. Tests were started in 1965 to determine whether young walleye would feed on an artificial diet, and thus reduce the problem of cannibalism in the ponds. Since 1969, all walleye reared were trained to feed on trout granules. The method consists of first incubating walleye eggs in standard hatchery jars until the fry hatch. The fry are then transferred to fertilized pond where the fish are reared to about 50 mm in length. At this stage they are transferred to troughs and raceways where they are trained to feed on trout granules. Young walleye are currently trough reared until they reach about 100 mm. Compared to pond rearing walleye to 100 mm, survival to this size can be improved by at least 6 fold by incorporating the trough rearing phase in the rearing period.--Copyright 1972, Biological Abstracts, Inc.
W73-12231

DEVELOPMENT AND OPERATION EFFICIENCY OF A CATFISH GRADER,
National Marine Fisheries Service, Rohwer, Ark.
D. C. Greenland, and R. L. Gill.
Prog Fish-Cult. Vol. 34 No. 2: p 76-80. 1972 Illus.
Identifiers: *Catfish grader, Development, Ictalurus-Punctatus, Operation, *Channel catfish, *Fish passager.

A grader to sort process-sized channel catfish (Ictalurus punctatus) was developed and tested. The unit was constructed of 8-ft-long horizontal bars having 1.75 in clear spacing. These bars were suspended 2 to 3 in. under the water surface. Fish were dumped onto one end of the grader. Smaller fish maneuvered between the bars and removed themselves from the population. Larger fish swam the length of the grader searching for an escape route and passed off the end. The addition of diverters installed at right angles to the grader bars caused larger fish to pass through the grader. Grading error was determined in vat tests and the minimum error, 15% , occurred when separating out fish 0.9 lb and larger. Fish size could be manipulated by changing bar spacing and adding the diverters.--Copyright (c) 1972, Biological Abstracts, Inc.
W73-12248

POTENTIALS OF THE REDEAR SUNFISH X GREEN SUNFISH HYBRID IN POND MANAGEMENT,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
R. C. Heidinger, and W. M. Lewis.
Prog Fish-Cult. Vol. 34, No. 2, p 107-109. 1972.
Identifiers: Hybrids (Sunfish), Lepomis-Cyanellus, Lepomis-Microlophus, Micropterus-Salmoides, Pond management, Potentials, *Sunfish (Redrear), *Sunfish (Green).

Populations of the redear sunfish (Lepomis microlophus) X green sunfish (L. cyanellus) F1 hybrid were produced both by stocking F1 fish and by stocking male redear sunfish and female green sunfish in farm ponds. The F1 fish, stocked at 1000/acre, attained weights of 0.6 and 0.7 lb by the end of their third summer. No F2 fish were observed to have survived. In ponds in which parental fish were stocked, F1 fish were produced each year. No back crosses and no F2 fish were observed to have been produced. The first yr. class of F1 fish attained a weight of 0.4 to 0.5 lb. by the end of the third summer. Largemouth bass (Micropterus salmoides) populations were produced along with the hybrid populations by stocking fingerling fish at the end of the summer following the spawn of the parental sunfish or introduction of F1 fish.--Copyright (c) 1972, Biological Abstracts, Inc.
W73-12253

CHANGE IN BODY WEIGHT CAUSED BY HANDLING AND EXERCISE IN FISH,
Hawaii Univ., Honolulu. Dept. of Zoology.
E. D. Stevens.
J Fish Res Board Can. Vol 29, No 2, p 202-203. 1972. Illus.
Identifiers: Acclimation, *Body weight (Fish), *Fish handling, *Fish exercise.

Either handling or exercise cause an increase in body weight in fish acclimated to freshwater, and a decrease in body weight in fish acclimated to sea water.--Copyright 1972, Biological Abstracts, Inc.
W73-12312

A SIMPLE ELECTRONIC SMOLT COUNTER,
Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries Lab.
D. M. Weiss.
J Fish Biol, Vol 4, No 2, p 257-260, 1972, Illus.
Identifiers: Electronic counter, Salmon, *Smolt counter, *Fish migration, Fish stocks.

The development of methods for the automatic counting of migratory fish has become a matter of some importance in the United Kingdom and elsewhere, owing to the increasing concern over the lack of accurate information about fish stocks. An instrument capable of counting fish accurately and reliably in a variety of conditions remains a goal towards which progress is being made only slowly, despite strenuous efforts by a number of organizations. The fish counters available at present are expensive to buy and sufficiently complex to be difficult to build by the majority of workers in fisheries management, there are, however, circumstances where fish may be counted by relatively simple means and an example is given. Salmon smolts swimming down a channel or tube could be reliably detected using a simple electronic circuit which was sensitive both to changes in resistance across 2 electrodes set in the water flow, and to the rate of change of resistance. These changes were amplified sufficiently to produce deflections on a recording meter so that subsequent examination of the chart gave both a count of the smolts and also the time of passage. Details of the circuit, which can be built at low cost and with only elementary equipment, are discussed briefly and some results are given.--Copyright 1972, Biological Abstracts, Inc.
W73-12332

EFFECTS OF THE FLOY ANCHOR TAG ON THE GROWTH AND SURVIVAL OF BROOK TROUT (SALVELINUS FONTINALIS),
Wisconsin Dept. of Natural Resources, Waupaca.
R. F. Carline, and O. M. Brynildson.
J Fish Res Board Can, Vol 29, No 4, p 458-460, 1972.
Identifiers: *Brook trout, Growth, Salvelinus-Fontinalis, Survival, *Tags (Floy anchor).

Two field trials were conducted to determine the effects of the gun-injected, Floy anchor tag (FD-67) on growth and survival of 10-mo.-old domesticated S. frontinalis in a 0.7 ha pond. Trials ran from Oct. to the following June. In 1968 106 tagged trout and 1005 controls, and in 1969, 300 tagged trout and 500 controls were stocked. Different fins were removed from each to determine tag loss. In both trials the trout were sampled twice through the ice and twice during open water. The tags retarded growth of the trout from Oct. to Jan.; differences in growth rates between tagged and controls were 18 and 28% for the 1968 and 1969 trials, respectively. After Jan. both groups grew at similar rates. The tags did not affect survival, and tag losses were 5.7 and 2% for the 2 trials.--Copyright 1972, Biological Abstracts, Inc.
W73-12336

09. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

ENVIRONMENTAL RESEARCH LABORATORIES IN THE FEDERAL GOVERNMENT--AN INVENTORY, VOLUMES I AND II,
Syracuse Univ. Research Corp., N. Y. Policy Inst.
A. H. Teich, P. H. Howard, and L. Sumnicht.
Available from NTIS, Springfield, Va 22151 as PB-209 751 and PB-209 752. Price $6.00 each volume, printed copy. September 1971. 978 p, 2 append. NSF Grant GI-35.

Descriptors: *Environmental control, *Federal Government, *Administrative agencies, Research facilities, Reviews, Indexing, Laboratories, On-site laboratories, Pollution, Pollution abatement, Water pollution control.
Identifiers: *U.S. Agencies, *Environmental research laboratories, Earth resources.

This inventory presents detailed information on the whole range of existing in-house capabilities in environmental research in the Federal Government. The two-volume report contains data on about 170 Federal laboratories. The inventory is unique in the scope and depth of its coverage of Federal research activities at the field level. It is accompanied by a user's guide and a detailed index. Volume I includes Federal Government agencies alphabetically from Agricultural Research Service through U.S. Air Force. Volume II includes agencies from U.S. Army through U.S. Coast Guard. (Woodard-USGS)
W73-11845

NATIONAL ACCELERATOR LABORATORY, BATAVIA, ILLINOIS. (ENVIRONMENTAL STATEMENT).
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05C.
W73-11902

ENVIRONMENTAL MONITORING REPORT FOR SANDIA LABORATORIES FROM 1964 THROUGH 1972,
Sandia Labs., Albuquerque, N. Mex.
For primary bibliographic entry see Field 05A.
W73-11908

COASTAL PLAINS REGIONAL COMMISSION--ANNUAL REPORT, 1972.
For primary bibliographic entry see Field 06E.
W73-11974

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

ENVIRONMENTAL RESEARCH LABORATORIES IN THE FEDERAL GOVERNMENT--AN INVENTORY, VOLUMES I AND II,
Syracuse Univ. Research Corp., N. Y. Policy Inst.
For primary bibliographic entry see Field 09C.
W73-11845

10C. Secondary Publication And Distribution

WATER REUSE, A BIBLIOGRAPHY, VOLUME 1.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11701

WATER REUSE, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-11702

ANNOTATED BIBLIOGRAPHY ON 14-MEV NEUTRON ACTIVATION ANALYSIS,
European Atomic Energy Community, Brussels (Belgium). Bureau Eurisotop.
For primary bibliographic entry see Field 05A.
W73-11919

ENVIRONMENTAL LAW ABSTRACTS, VOLUME II,
Oak Ridge National Lab., Tenn. Environmental Information Systems Office.
J. W. Curlin, and J. D. Jones.
Report ORNL-EIS-72-9, November 1972. 195 p. NSF-AAA-R-4-79.

Descriptors: *Water law, *Abstracts, *Documentation, *Bibliographies, Publications, Water pollution control, Environmental protection, Water resources, Planning.

This user-oriented research project of the Oak Ridge National Laboratory produced in collaboration with the University of Tennessee College of Law, is an attempt to bridge the communication gap between scientists and lawyers. The bibliography is useful to those in the legal profession who are concerned with environmental problems. Bibliographic citations, abstracts, and key words describing the literature are in a format which is designed for computer retrieval by key words. Comprehensive and extensive treatment is given to air pollution, drainage, environmental control, forests, marine resources, natural resources, pollution, public lands, regional planning, science, zoning, territorial waters, and watercourses. In addition, agriculture, city planning, easements, eminent domain, mines, the nuclear industry, oil and gas, real property, space law, state agreements, and treaties are scanned for pertinent environmental titles. The thesaurus is organized under descriptor subdivisions and for maximum flexibility and economy of retrieval, some key words have compound entries. An author index is also included. (Mockler-Florida)
W73-11998

WATER PUBLICATIONS OF STATE AGENCIES. A BIBLIOGRAPHY OF PUBLICATION ON WATER RESOURCES AND THEIR MANAGEMENT PUBLISHED BY THE STATES OF THE USA.
Water Information Center: Port Washington, N.Y. 1972. 319 p, Illus. Pr $39.50. G. J. Giefer, and D. K. Tood, editors.
Identifiers: *Bibliographies, Books, Management, Publications, *State agencies, Water resources.

The publication information given here is largely that supplied by the agencies themselves. The bibliographic format employed by each agency has been retained, and an address is given for every state agency listed. Brief introductory statements with information as to availability and price of publications have been included where they were supplied. The water resources research centers established in each state under Public Law 88-376 have been included. Agricultural experiment stations, agricultural extension service agencies, and interstate agencies are omitted. In those cases where the orientation of an agency includes water as only one element in a broader spectrum, only those titles from their publications were included which were directly related to water resources. In the case of State Department of Fisheries, titles are listed which reflect a close association between the fishery resource and the water resource; the same criterion was applied in regard to wildlife.—Copyright 1973, Biological Abstracts, Inc.
W73-12161

RHODE ISLAND MARINE BIBLIOGRAPHY.
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 02L.
W73-12316

DISSOLVED ORGANIC MATTER IN NATURAL WATERS: A SELECTED BIBLIOGRAPHY, WITH EMPHASIS ON ANALYTICAL METHODS,
State Univ. Coll., Plattsburgh, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 02H.
W73-12329

10F. Preparation of Reviews

ISOTOPE METHODS IN GROUNDWATER SCIENCE (ISOTOPENMETHODEN IN DER GRUNDWASSERKUNDE),
European Atomic Energy Community, Brussels (Belgium). Bureau Eurisotop.
For primary bibliographic entry see Field 02F.
W73-11929

SOME REMARKS ON MERCURY AS AN AQUATIC POLLUTANT AND ITS IMPLICATIONS,
Helsinki Univ. (Finland). Dept. of Radiochemistry
For primary bibliographic entry see Field 05C.
W73-12263

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W73-11904 5C

Final Environmental Statement Related to Operation of Fort Calhoun Station Unit 1.
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Final Environmental Statement Related to the Proposed Hanford Number Two Nuclear Power Plant.
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CENTERS OF COMPETENCE
AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 20
OCTOBER 15, 1973

W73-12351 -- W73-13000

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 20
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

SOVIET STUDY SHOWS POLYWATER DOESN'T EXIST.
Chemical and Engineering News, Vol 51, No 29, p 13-14, July 16, 1973.

Descriptors: *Water chemistry, *Capillary water, Physical properties, Chemical properties, Capillary action, Cohesion, Adhesion, Molecular structure, *Silicates, Water types, Aqueous solutions, Foreign research.
Identifiers: *Polywater, Soviet Union.

The controversy over the existence of 'polywater' (also called 'water II', 'anomalous water', 'orthowater', or 'superwater') has been terminated by its primary originator and chief investigator, Dr. Boris V. Derjaguin (Deryagin) of the Institute of Physical Chemistry of the USSR Academy of Sciences. In a critical review article on world-wide research activities on polywater, titled 'The state-of-the-arts in liquids' modification by condensation', published in 'Recent Advances in Adhesion' (Lieng-Huang Lee, editor; Gordon and Breach, New York and London, 1973), the anomalous behavior of water II is admitted by Derjaguin to be due to impurities, notably silicates leached from the quartz walls of capillary tubes in which anomalous water has to be prepared by condensation. Recent experimental evidence refuting the hypothesis of anomalous polymeric water is mentioned. (Brown-TPC)
W73-12540

02. WATER CYCLE

2A. General

HYDROLOGICAL YEAR-BOOK OF ISRAEL, 1970/71.
Ministry of Agriculture, Jerusalem (Israel). Water Commission.

Hydrological Service Publication, 1972. 161 p.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Hydrologic systems, Foreign countries, Basic data collections, Precipitation (Atmospheric), Streamflow, Runoff, Flow rates, Gaging stations, Water yield, Groundwater movement, Water levels, Water quality, Groundwater recharge, Saline water intrusion, Salinity.
Identifiers: *Israel.

This hydrological yearbook of Israel is the 26th in the series of Hydrological Year-Books. Hydrological and chemical data are presented for the gauging stations on rivers, wadis, main springs, lakes, and reservoirs for the period from October 1, 1970, to September 30, 1971. Yearly rainfall amounted from 80% to 140% of the 1931-60 average in most parts of the country. During November-January rainfall was below average; during April in most regions it was 6 to 14 times that of the long-range average for this month. The total flow from Nahal Keziv in the north to Nahal Shiqma in the south reached about 105 million cu m in 1970-71. Added to this amount was the base flow of Nahal Tanninim and Nahal Ada (downstream the diversion of the Nahaley Menashe project), which amounted to 60 million cu m, with chlorine content of about 850 mg/liter. This total flow measured at the hydrometric stations drains a catchment area of about 6500 sq km compared to the 7800 sq km representing the whole catchment area. The total streamflow includes the quantities stored in various surface reservoirs. In the Kefar Barukh reservoir about 4.3 million cu m were stored, in the Nahaley Menashe reservoirs 15.5 million cu m, and in Shiqma reservoir about 0.9 million cu m were stored. In the spring of 1971, the groundwater level increased by 0.5 m to 1.5 m from that of the previous spring in the northern Coastal Plain. (Woodard-USGS)
W73-12432

HYDROLOGIC MODELS FOR POORLY DEFINED DRAINAGE AREAS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
W. Viessman, Jr.
Available from the National Technical Information Service as PB-222 182, $3.00 in paper copy, $1.45 in microfiche. Project Completion Report, June 1973, 50 p, 27 fig, 5 tab, 26 ref. OWRR-A-021-NEB (1). 14-31-0001-3827.

Descriptors: Hydrology, *Model studies, Rainfall-runoff relationships, *Nebraska, *Drainage area, *Seepage, Management, Storms, *Water management (Applied).

In central Nebraska and many other areas of the Midwest, complex water management problems often arise due to: (1) the flat relief; (2) large surface depressions; (3) rising groundwater levels due to surface irrigation or canal seepage; (4) intense summer storm activity; and (5) poorly defined surface channels. This project was designed to develop modeling techniques for such areas. An individual storm-event model was constructed which employs a series of interconnected reservoirs to simulate large depressed areas.
W73-12496

AN APPROACH TO HYDROGEOLOGIC INVESTIGATIONS OF RIVER ALLUVIUM BY THE USE OF COMPUTERIZED DATA PROCESSING TECHNIQUES,
Oklahoma State Univ., Stillwater. Dept. of Geology.
D. C. Kent, J. W. Naney, and B. B. Barnes.
Ground Water, Vol 11, No 4, p 30-41, July-August 1973. 7 fig, 3 tab, 13 ref.

Descriptors: *Surface-groundwater relationships, *Hydrogeology, *Data processing, *Alluvium, Mathematical models, Alluvial channels, Water balance, Data storage and retrieval, Aquifers, Computer programs, Mapping, Stratigraphy, Oklahoma.

A data storage and retrieval system for hydrogeologic data is designed to produce lithology distribution maps, isophachous maps, and cross sections showing the boundaries and hydraulic characteristics of river alluvium. Emphasis is placed on selecting and coding characteristics of the alluvial sediments, which will facilitate description in terms of hydraulic properties. The hydraulic properties of fluvial deposits for input to the system are defined by analysis of core samples and pump tests. A groundwater study was conducted in the Washita River valley in south-central Oklahoma. Maps and cross sections from the retrieval system were used in conjunction with the hydraulic coefficients and water-level records to estimate the rate of groundwater flow and storage. This information was used for developing a mathematical model of surface runoff as influenced by upstream tributary development. (Knapp-USGS)
W73-12942

FLOW TO WELLS NEAR STREAMS IN THE PRESENCE OF DELAYED YIELD FROM STORAGE AND ANALYSIS OF PUMPING TEST DATA,
Bulgarian Academy of Sciences, Sofia. Geological Inst.
For primary bibliographic entry see Field 04B.
W73-12943

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION.
Geological Survey, Menlo Park, Calif.

Open-file report, 1973. J. S. Bader, and F. Kunkel, compilers. 111 p.

Descriptors: *Bibliographies, *Water resources, *California, *Publications, Documentation, Information retrieval, Hydrology, Climatic data, Meteorological data, Hydrologic data, Surface waters, Groundwater, Streamflow, Runoff, Water quality, Chemical analysis, Water pollution sources, Water pollution control, Ecology, Water supply, Water demand, Water utilization, Water resources development, Management, Programs, Indexing.

The U.S. Geological Survey has been making water-resources studies in cooperation with the State of California and other public agencies since 1898. This bibliography lists alphabetically by author all water-resources reports prepared by the Geological Survey for those agencies through March 1973. It also lists selected nationwide reports that contain information pertinent to California. In addition, general hydrologic and research reports by personnel of the California district office or the Western regional office at Menlo Park, Calif., are included. The bibliographic list is indexed according to hydrologic area, county, and subject. A report may be indexed under one or more hydrologic areas, counties, and (or) subjects. (Woodard-USGS)
W73-12953

PUBLICATIONS OF WATER RESOURCES INVESTIGATIONS IN COLORADO AND SELECTED PUBLICATIONS PERTAINING TO COLORADO.
Geological Survey, Denver, Colo. Water Resources Div.

Geological Survey, Colorado District report, 1973. 33 p.

Descriptors: *Water resources, *Publications, *Bibliographies, *Colorado, *Projects, Investigations, Water resources development, Groundwater, Surface waters, Geology, Sediment transport, Hydrologic data, Aquifers, Streamflow, Floods, Water quality, Information retrieval.

The water-resources program of the U.S. Geological Survey consists of the collection of basic information through its hydrologic-data stations, areal hydrologic and interpretive studies, and research projects. The basic data collected, the results of the areal studies, and the research findings are presented mainly in publications of the U.S. Geological Survey and Colorado agencies, but some appear also in technical journals and other publications. This list contains publications of water-resources investigations in Colorado that are either published or in preparation and selected publications pertaining to Colorado. (Woodard-USGS)
W73-12954

2B. Precipitation

THEORY OF PRECIPITATION EFFECTS ON DEAD CYLINDRICAL FUELS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. A. Fosberg.
For Sci Vol 18, No 2, p 98-108. 1972. Illus.
Identifiers: *Forest fuels, *Precipitation theory, Water uptake.

Numerical and analytical solutions of the Fickian diffusion equation were used to determine the effects of precipitation on dead cylindrical forest

fuels. The analytical solution provided a physical framework. The numerical solutions were then used to refine the analytical solution through a similarity argument. The theoretical solutions predicted realistic rates of water exchange and the internal distribution of the water. The theory also predicted that precipitation duration rather than amount or rate determined the amount of water uptake and provided a function useful in practical applications.--Copyright 1972, Biological Abstracts, Inc.
W73-12381

WATER CONTENT IN CONVECTIVE STORM CLOUDS,
National Center for Atmospheric Research, Boulder, Colo.
T. G. Kyle, and W. R. Sand.
Science, Vol 180, No 4092, p 1274-1276, June 22, 1973. 2 fig, 6 ref.

Descriptors: *Clouds, *Moisture content, Storms, Convection, Hydrologic cycle, Aircraft, Sampling, Measurement, Instrumentation, Atmosphere, Meteorology.
Identifiers: *Storm clouds.

As part of the National Hail Research Experiment, the condensed water content of severe convective storm clouds was measured with an electrically heated evaporator mounted at the wing tip of an armored penetrating aircraft. Cloud interiors were found to be characterized by 1 to 2 km long regions having condensed water contents of approximately 20 g per cu m. (Brown-IPC)
W73-12536

CLIMATOLOGY OF RAINFALL PROBABILITIES FOR OAHU, HAWAII,
National Weather Service, Honolulu, Hawaii. Pacific Region.
A. N. Hull, and J. Pitko.
Available from NTIS, Springfield, Va. 22151, as COM-73-10242 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum NWSTM PR-10, April 1972. 48 p, 23 fig, 3 tab, 2 append.

Descriptors: *Climatic data, *Hawaii, *Meteorological data, *Precipitation (Atmospheric), *Weather forecasting, Probability, Statistics, Weather data, Weather patterns, Orography, Winds.
Identifiers: *Oahu (Hawaii).

Probability forecasts are given for local and island-wide rainfall for Oahu, Hawaii. Statistical probability of rainfall is tabulated by months. Also included is the persistence of 'wet' or 'dry' periods. The combination of climatological probability of rainfall and the persistence of the present weather are essential information for reaching a logical forecast of rain or no rain for any location on the island of Oahu. Maps show the statistical probability of daily rainfall for Oahu for each month of the year as well as an annual summary. Also included is a brief description of the various rainfall regimes that are found on the island. The data used in preparing the maps were extracted from the latest 30 years (1941-1970) of rainfall records. For regions of sparse data, shorter periods of record were used but in no case were records with less than 15 years entered into the analyses. In all, the data from 68 stations were plotted and analyzed. The frequency distribution of hourly rainfall statistics was gained by compiling hourly data for five stations representing different rainfall regimes on Oahu. For the normally dry areas of Oahu, summer has the lowest percentage of rainy days per month and winter the highest percentage. July presents an anomalously high percentage in most of these dry areas. In the normally wet areas of Oahu, summer has the highest percentage of rainy days per month with winter having the lowest percentage. The most populated areas of the island normally have monthly percentages of rainy days in the range of 40%-60% each month. (Knapp-USGS)
W73-12587

EXTREMES OF HYDROMETEORS AT ALTITUDE FOR MIL-STD-210B: SUPPLEMENT--DROP-SIZE DISTRIBUTIONS,
Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
P. Tattleman, and N. Sissenwine.
Available from NTIS, Springfield, Va. 22151 as AD-756 832 - Price $3.00 printed copy; $1.45 microfiche. Technical Report AFCRL-TR-73-0008, January 9, 1973. 15 p, 1 fig, 3 tab, 8 ref.

Descriptors: *Rainfall intensity, *Rain, *Tropical regions, *Raindrops, Rain water, Rainfall, Precipitation (Atmospheric).
Identifiers: *Raindrop sizes.

Estimates have been provided for extreme rainfall intensities and associated liquid water content at altitude with 0.1% and 0.5% probabilities in the most severe month in the rainy tropics. Analogous values have been included for two alltime record rainstorms, one for 1 min, and the other lasting 42 min. Drop-size distributions are given for the 1 min record, and for the 0.1% and 0.5% worst month in tropics from a theoretical expression that best fits the available empirical size distributions. Liquid water content obtained from an integral of this theoretical expression is compared to the liquid water content obtained by arithmetically adding the volumes of each drop for three drop-size distributions. (Knapp-USGS)
W73-12599

ON THE NUMBER DISTRIBUTION OF HAIL GROWING IN UPDRAFTS,
Toronto Univ. (Ontario). Dept. of Physics.
R. B. Charlton, and R. List.
Available from NTIS, Springfield, Va. 22151 as COM-72-11428 - Price $3.00 printed copy; $1.45 microfiche. In: Proceedings of Conference on Cloud Physics, August 24-26, 1970, Fort Collins, Colorado: Colorado State University, p 51-52, 1971. 7 fig, 3 ref.

Descriptors: *Cloud physics, *Hail, *Crystal growth, *Air circulation, Convection, Atmosphere, Freezing, Model studies, Storms, Graupel, Meteorology, Mass curves.

The formation of hail in a convection updraft causes liquid water depletion and imposes a body force on the updraft's air parcels. Conversely, the growth of hailstones is dependent on their ability to compete for the available liquid water and on the updraft field's reaction to their presence. A model is based on hail embryos injected continuously in known numbers and sizes at the OC level of a nondivergent (cloud air density times updraft velocity equals constant at all levels) and predetermined updraft. The only cloud parameter directly influenced by the growing hailstones is the liquid water content (LWC). The hailstones move at terminal velocity (drag coefficient 0.5) and accrete (with 100% efficiency) the LWC which moves at updraft speed. Two types of growth from an embryo size spectrum are considered, both of which are steady-state. The first grows hail as it ascends from the input level. The second type considers hailstones ascending to their balance levels and also growing while descending back to the input level. All examples calculated showed that hail mass accumulation zones can be equivalent only to 2 to 4 times the natural LWC, and that moderate LWC depletion (20-40%) is equally sufficient to considerably influence the cloud's energy balance. (Woodard-USGS)
W73-12602

DYNAMICS OF A FALLING PARTICLE ZONE,
Toronto Univ. (Ontario). Dept. of Physics.
T. L. Clark, and R. List.
Available from NTIS, Springfield, Va. 22151 as COM-72-14428 - Price $3.00 printed copy; $1.45 microfiche. Journal of the Atmospheric Sciences, Vol 28, No 5, p 718-727, July 1971. 8 fig, 12 ref. NOAA Grant E22-75-71 (G).

Descriptors: *Cloud physics, *Precipitation (Atmospheric), *Particle size, Raindrops, Dynamics, Model studies, Numerical analysis, Meteorological data, Temperature, Winds, Velocity, Atmosphere, Air circulation, Equations, Drops (Fluid).
Identifiers: *Precipitation particles.

Some of the factors which can affect the distribution of precipitation-sized particles within a cloud are coalesence, breakup, sedimentation, and gravitational feedback effects. The two latter factors are discussed. Two-dimensional zones of single-sized particles falling in still air are discussed using a numerical model. Coalescence and breakup is ignored so that the fall pattern and the flow created by the falling particles can be isolated. The results indicate that the rather unorthodox use of an eddy viscosity in the momentum equations and not in the advection equation for the particle zone did not affect the calculations appreciably. Thus, the results can be assumed to visualize the nonturbulent case of a falling particle zone. (Woodard-USGS)
W73-12603

SIMULATIONS OF METEOROLOGICAL VARIATIONS OVER ARCTIC COASTAL TUNDRA UNDER VARIOUS PHYSICAL INTERFACE CONDITIONS,
Center for the Environment and Man, Inc., Hartford, Conn.
N. W. Lord, J. P. Pandolfo, and M. A. Atwater.
Arct Alp Res. Vol 4, No 3, p 189-209. 1972. Illus.
Identifiers: *Arctic coastal zone, *Meteorological conditions, Moisture, *Simulation, Temperature, *Tundra.

Meteorological properties of the tundra are treated within the context of a general ecosystem model. The biosphere is placed in the role of an active interface within a stack of horizontally uniform physical layers under the influence of incident solar radiation, the demonstrably dominant exogenous state variable. Diurnal variation of the thermodynamic states of these physical layers is calculated as the solution of differential equations governing the diffusion of heat and moisture. The results of numerical experiments on dry ground regions demonstrate that atmospheric moisture and temperature, during the biotically active summertime, are influenced by the meteorological history of the immediately preceding summertime level of the permafrost boundary. They are influenced to a degree that is at least comparable to the effect of daily fluctuations in cloud cover and prevailing winds. Numerical experiments on tundra shallow lakes imply a strong influence by the region's heterogeneity on near-surface air temperatures.--Copyright 1973, Biological Abstracts, Inc.
W73-12983

2C. Snow, Ice, and Frost

TRITIUM AND DEUTERIUM CONTENT OF THE SNOW IN GROENLAND,
For primary bibliographic entry see Field 05B.
W73-12418

GLACIAL ENVIRONMENT AND PROCESSES IN SOUTHEASTERN ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
J. H. Hartshorn, and G. M. Ashley.
Technical Report No 4-CRC, August 1972. 69 p, 79 fig. ONR N00014-67-A-0230-0001.

Descriptors: *Erosion, *Sedimentation, *Glaciation, *Alaska, *Geomorphology, Land forming, Topography, Sediment transport, Glacial drift, Alluvial fans, Alluvium, Glaciers, Braiding, Sedimentary structures.

The dominant surficial geologic processes in southeastern Alaska are glaciation and stream action. Glaciers erode bedrock, sculpture characteristic landforms, and deposit subglacial and marginal debris. In areas vacated by the glacier, sediment-laden streams help to construct a landscape whose varied landforms originate from the complex interaction between a retreating ice margin, disintegrating ice, and running or ponded meltwater. The major landforms in terms of area and volume are outwash fans, which are formed seaward of the glaciers mainly by the accretion of bars in braided streams, and which commonly form the low-lying coastal foreland. The sediment in transport in meltwater streams may be stored permanently or temporarily in glaciofluvial landforms or may reach its ultimate destination, the sea, where it is reworked by coastal erosion and deposition. (Knapp-USGS)
W73-12423

PROBLEMS IN THE PRODUCTION OF A SPRING FLOOD (VOPROSY FORMIROVANIYA VESENNEGO POLOVOD'YA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W73-12435

INVESTIGATION OF THERMAL PROPERTIES OF SOILS IN THE DON RIVER BASIN FOR ESTIMATION OF SNOWMELT LOSSES TO INFILTRATION INTO FROZEN SOIL (ISSLEDOVANIYE TEPLOVYKH SVOYSTV POCHV BASSEYNA R. DONA DLYA OTSENKI POTER' TALYKH VOD NA IN FIL'TRATSIYU V MERZLUYU POCHVU),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12436

LABORATORY INVESTIGATIONS OF THE TRANSMISSION CAPACITY OF FROZEN AND THAWED SOILS BASED ON DATA OF THE VALDAY FIELD LABORATORY (VNIGL) (LABORATORNYYE ISSLEDOVANIYA VODOPROPUSKNOV SPOSOBNOSTI MERZLYKH I TALYKH POCHVO-GRUNTOV (PO MATERIALAM MERZLOTHOY LABORATORII VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12437

EVAPORATION DURING A FLOOD PERIOD CAUSED BY SPRING SNOWMELT (ISPARENIYE V PERIOD VESENNEGO SNEGOTAYANIYA I POLOVOD'YA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02D.
W73-12442

GREEN SNOW AND ICE FROM THE ANTARCTICA,
National Museum of Natural History, Budapest (Hungary).
For primary bibliographic entry see Field 02I.
W73-12644

LAKE MOVEMENTS WITH PARTIAL ICE COVER,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 02H.
W73-12663

SNOW COVER OF THE ISSYK-KUL' DEPRESSION AND ITS ALPINE ENVIRONMENT (SNEZHNYY POKROV ISSYK-KUL'SKOY KOTLOVINY I YEYE VYSOKOGORNOGO OBRAMLENIYA),
A. N. Dikikh.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 1, p 47-51, January-February 1973. 1 fig, 3 tab, 3 ref.

Descriptors: *Snow cover, *Snowpacks, *Alpine, *Mountains, Glaciers, Density stratification, Precipitation (Atmospheric), Weather, Air temperature, Snow surveys, Maps.
Identifiers: *USSR (Kirgiz), *Issyk-Kul' depression.

Characteristics of snow cover in the Issyk-Kul' depression were investigated in snow surveys performed by the Kirgiz Administration of the Hydrometeorological Service. Average duration of snow cover ranges from 39 days in the vicinity of Cholpon-Ata to 297 days in the glacierized zone. Snow density in the initial period of formation of snow cover varies between 0.16 and 0.20 g/cu cm. Snow density on glaciers in the initial period of snow accumulation reaches 0.40 g/cu cm. On the basis of snow-cover distribution, 4 regions were identified: (1) the western part, where snow depths are 0-10 cm; (2) the central and eastern parts, where snow depths are 10-50 cm; (3) the northern slopes of Terskey Alatoo ridge in the eastern part, where snow depths are 50-100 cm; and (4) the glacierized zone of the ridge, where snow depths are greater than 100 cm. Maximum average 10-day depths of snow cover in the depression are tabulated and mapped. (Josefson-USGS)
W73-12726

TRIALS ON TRENDS THROUGH CLUSTERS OF CIRQUES,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 02J.
W73-12732

THE EFFECT OF SOIL TEMPERATURE ON PLANTS GROWN IN SALINE SOIL,
Hebrew Univ., Rehovot (Israel). Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-12797

ESTIMATING SNOW-WATER EQUIVALENT FROM POINT-DENSITY MEASUREMENTS OF FOREST STANDS,
Canadian Forest Service, Edmonton (Alberta).
For primary bibliographic entry see Field 04A.
W73-12827

SIMULATIONS OF METEOROLOGICAL VARIATIONS OVER ARCTIC COASTAL TUNDRA UNDER VARIOUS PHYSICAL INTERFACE CONDITIONS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 02B.
W73-12983

2D. Evaporation and Transpiration

EVAPORATION DURING A FLOOD PERIOD CAUSED BY SPRING SNOWMELT (ISPARENIYE V PERIOD VESENNEGO SNEGOTAYANIYA I POLOVOD'YA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. I. Krestovskiy, A. N. Postnikov, and A. G. Sergeyeva.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 165-182, Leningrad, 1972. 1 fig, 8 tab, 28 ref.

Descriptors: *Evaporation, *Floods, *Snowmelt, *Spring, Water loss, Water balance, Water storage, Runoff, Precipitation (Atmospheric), Snow, Water equivalent, Soils, Surfaces, Watersheds (Basins), Forest watersheds, Grasslands, Estimating, Measurement, Equations.
Identifiers: European USSR, *Kazakhstan.

Evaporation from snow, water, and soil surfaces in spring was investigated on lowland areas in European Russia and DKazakhstan. Estimates are made of losses of water to evaporation during a flood period for watersheds in forested and forest-steppe regions of European Russia, and methods are proposed for evaporation measurements in the northwest. In the northwestern forested region, total evaporation from watersheds varies annually between 35 mm and 90 mm (average 60 mm) and depends mainly on the duration of the spring flood. In forest-steppe and steppe regions, total evaporation from watersheds during flood periods for different spring seasons varies between 15 mm and 60 mm (average 35-45 mm). In northwestern and forest-steppe regions, total evaporation averages 1.2 mm/day. Water losses to total evaporation in forested and forest-steppe regions average 30% of the precipitation and water equivalent of snow in a flood period and vary annually from 10% in flood periods with heavy snow accumulation to 70% in relatively open spring seasons. (See also W73-12435) (Josefson-USGS)
W73-12442

A COMPARISON OF RATES OF WATER LOSS THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES,
New Mexico State Univ., University Park. Dept. of Biology.
G. L. Cunningham, J. G. Fraser, R. E. Grieve, and H. G. Wolfe.
Available from the National Technical Information Service as PB-222 277, $3.00 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Report No. 025, Technical Completion Report, 1973, 32 p, 12 fig, 4 tab, 17 ref. OWRR-B-021-NMEX (1) and B-027-NMEX (1).

Descriptors: *Phreatophytes, *New Mexico, *Transpiration, Transpiration control, Mathematical models, *Water loss, Riparian plants, *Riparian water loss.
Identifiers: *Species leaf surface area, Basal stem diameter, Boundary layer resistance, Stomatal resistance, Mesophyll resistance, Irradiance, Prosopis pubescens (Screw bush), Salix amygdaloides (Willow), Tamarix pentandro (Salt cedar), Baccharis glutinosa (Seep willow), Lycium torieyi (Wolfberry), Populus fremontii (Cottonwood).

The development and use are described of a method of estimating transpirational water use by riparian plant communities. The method involves the development and use of mathematical models to predict transpiration rates on a leaf area basis from environmental data. These models were used in conjunction with leaf area estimates for a study stand to evaluate transpirational water use. The results indicate that differences exist among species. Species which are found in less disturbed stands tend to be much more conservative in their transpirational water use. (Creel-New Mexico State)
W73-12497

WATER PATHWAYS IN HIGHER PLANTS: III. THE TRANSPIRATION STREAM WITHIN LEAVES,
Southampton Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 02I.
W73-12652

AVERAGE BOWEN-RATIO METHODS OF CALCULATING EVAPORTRANSPIRATION APPLIED TO A DOUGLAS FIR FOREST,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. A. Black, and K. G. McNaughton.
Boundary-Layer Meteorol. Vol 2, No 4, p 466-475. 1972. Illus.
Identifiers: *Bowen-ratio method, *Douglas-Fir, *Evapotranspiration, Forests, Transpiration, Winds, Measurement.

Daily evapotranspiration from a Douglas fir forest was calculated using Webb's average Bowen-ratio method. Webb's method is generalized to include the effects of the diabatic wind profile. Over a 17-day period characterized by light winds, the modified Webb method agreed with the daily totals of half hr energy balance calculations to within 1 1/2% on the average, while Webb's method overestimated by 26% on the average.--Copyright 1973, Biological Abstracts, Inc.
W73-12801

HEAT AND WATER BALANCE STUDIES ON GRAND CAYMAN,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S-A. Hsu, M. E. C. Giglioli, P. Reiter, and J. Davies.
Caribb J Sci. Vol 12, No 1-2, p 9-22, 1972, Illus.
Identifiers: *British West Indies, *Grand Cayman Island (B.W.I.), Heat balance, Mangrove, Swamp, Transpiration, Water balance, *Evapotranspiration.

On the basis of field measurements from 1967 through 1970 and all available climatological data on Grand Cayman Island (British West Indies), components of heat and water-balance equations were analyzed. Water-balance studies on a riverless, tropical coast showed that the soil-moisture content can be estimated by measuring the difference between precipitation and evaporation on sandy coasts and between precipitation and evapotranspiration in mangrove swamp areas. Heat-balance studies in the same environments revealed that on a mangrove swamp floor the potential evapotranspiration can be predicted by the ratio of net radiation to latent heat of vaporization.--Copyright 1973, Biological Abstracts, Inc.
W73-12822

WATER POTENTIAL IN RED PINE: SOIL MOISTURE, EVAPOTRANSPIRATION, CROWN POSITION,
Minnesota Univ., St. Paul. Coll. of Forestry.
For primary bibliographic entry see Field 02I.
W73-12837

SOME EFFECTS OF EVAPORATION SUPPRESSION ON RESERVOIR ECOLOGY,
North Texas State Univ., Denton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12869

ANTITRANSPIRANT FILM: CURTAILING INTAKE OF EXTERNAL WATER BY CHERRY FRUIT TO REDUCE CRACKING,
California Univ., Davis. Dept. of Water Science and Engineering.
D. C. Davenport, K. Uriu, and R. M. Hagan.
Hortscience, Vol 7, No 5, p 507-508, 1972. Illus.
Identifiers: Absorption, *Cherry fruit, Cracking, Films, Fruit, Prunus-avium, Rain, *Antitranspirant films.

An antitranspirant film was used as a research tool to determine which part of the sweet cherry (Prunus avium L.) fruit is the principal path for absorption of external water (rain). Antitranspirant applied to the entire fruit surface reduced water intake to half that of control fruit or fruit treated only on the top and/or bottom. A preliminary field trial investigated the film's 'raincoating' effect as a possible means for reducing cherry cracking.--Copyright 1973, Biological Abstracts, Inc.
W73-12992

ANTITRANSPIRANTS FOR CONSERVATION OF LEAF WATER POTENTIAL OF TRANSPLANTED CITRUS TREES,
California Univ., Davis. Dept. of Water Science and Engineering.
D. C. Davenport, P. E. Martin, and R. M. Hagan.
Hortscience. Vol 7, No 5, p 511-512, 1972. Illus.
Identifiers: *Antitranspirants, *Citrus, Leaf-water potential, Transplanted trees, Water conservation.

Spraying 7-yr-old citrus trees with film-forming antitranspirants before transplanting increased leaf water potential, thereby reducing 'transplant shock'. Leaf water potential decreased rapidly after transplanting, by as much as 21 atm in unsprayed, and as little as 6 atm in sprayed trees. There was little benefit from transplanting in late afternoon rather than the morning.--Copyright 1973, Biological Abstracts, Inc.
W73-12993

RELATIVE WATER CONTENT OF LEAVES: UNDERESTIMATION CAUSED BY ANTITRANSPIRANT FILM,
California Univ., Davis. Dept. of Water Science and Engineering.
D. C. Davenport.
J Exp Bot. Vol 23, No 76, p 651-654, 1972.
Identifiers: Films, *Leaves, Relative, *Antitranspirant films.

When leaf discs are floated to obtain turgid weight in the assessment of the effect of an antitranspirant film on relative water content, water trapped by the film itself gives an over-estimation of turgid weight, and hence a low value for relative water content.--Copyright 1973, Biological Abstracts, Inc.
W73-12994

2E. Streamflow and Runoff

PREDICTION OF MIXING LENGTHS FOR RIVER FLOW GAGING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-12414

COMPUTING BACKWATER AT OPEN CHANNEL CONSTRICTIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W73-12415

EXTREME ROUGHNESS OF NATURAL RIVER CHANNEL,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B.
W73-12416

FACTORS PRODUCING THE OUTSTANDING SPRING FLOOD OF 1970 IN UPPER DON RIVER BASINS (USLOVIYA FORMIROVANIYA VYDAYUSHCHEGOSYA VESENNEGO POLOVOD'YA 1970 G. V BASSEYNAKH REK VERKHNEGO DONA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
L. K. Vershinina.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 75-92, Leningrad, 1972. 4 fig, 9 tab, 6 ref.

Descriptors: *Floods, *Spring, *River basins, Discharge (Water), Runoff, Water loss, Water balance, Water storage, Precipitation (Atmospheric), Water equivalent, Snowmelt, Melt water, Thawing, Ice, Antecedent moisture content, Field capacity, Air tempeerature, Equations.
Identifiers: USSR, *Don River.

The factors responsible for the 50 to 100 year flood on the Upper Don in the spring of 1970 are examined. An exceptionally high rate of snowmelt, reaching 40-50 mm/day, was observed in northern regions of the basin, while the rate of snowmelt in southern regions did not exceed 5-10 mm/day. This difference in snowmelt rates was the principal cause of major flooding in the north and of minor flooding in the south. Spring-runoff losses were 120-150 mm or 70% of total water storage in southern regions and 30-40 mm or 15%-25% of total water storage in northern regions. (See also W73-12435) (Josefson-USGS)
W73-12440

HEATED SENSORS FOR FLOW MEASUREMENTS,
For primary bibliographic entry see Field 07B.
W73-12618

THE SUPERIMPOSITION HYPOTHESIS FOR INCISED MEANDERS--A GENERAL REJECTON AND SPECIFIC TEST,
Makerere Univ., Kampala (Uganda).
K. J. Tinkler.
Area (Institute of British Geographers), Vol 4, No 2, p 86-91, 1972. 1 fig, 12 ref.

Descriptors: *Meanders, *Geomorphology, Valleys, Topography, Paleoclimatology, Drainage patterns (Geologic).

The superimposition hypothesis that incised bedrock meanders are inherited from river (alluvial) meanders in a previous low relief cycle is disputed. A specific test based on known area/wavelength relationships for valley and river meanders is proposed. The lithological environment of the channel exerts a controlling influence on channel meander wavelength. There is no great difference between the dimensionless ratios that characterize the geometry of meanders incised in rock and those for alluvial, or river, meanders. The lithological environment acts as a filter on wavelengths so that for a given lithology, wavelengths begin to form only when some threshold stress is overcome by channel flow sufficient to induce bank erosion. A wide range of discharges is in fact available in most streams. For most lithologies a discharge with sufficient power to induce bank erosion probably exists in most streams given a long enough recurrence interval. It is evident that meander parameters are not unambiguous indicators of Pleistocene climates. (Knapp-USGS)
W73-12736

CLIMATIC CHANGE AND ARRESTED MEANDER DEVELOPMENT ON THE RIVER SEVERN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 04A.
W73-12737

A PROPOSED STREAMFLOW DATA PROGRAM FOR CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04A.
W73-12748

STAGE-DISCHARGE RELATIONS ON BIG LOST RIVER WITHIN NATIONAL REACTOR TESTING STATION, IDAHO,
Geological Survey, Idaho Falls, Idaho. Water Resources Div.
For primary bibliographic entry see Field 04A.
W73-12750

PRELIMINARY FLOOD-FREQUENCY RELATIONS FOR SMALL STREAMS IN GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 04A.
W73-12946

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
C. P. Laughlin, and M. C. Schol.
Geological Survey Open-file report (73009), 1973. 87 p, 47 fig, 24 tab, 4 ref.

Descriptors: Water resources, *Hydrologic data, *Groundwater, *Surface waters, *Florida, Basic data collections, Rainfall, Streamflow, Runoff, Aquifer characteristics, Well data, Water levels, Water quality, Chemical analysis, Lakes, Hydrology.
Identifiers: *Lake County (Fla).

Records of water levels in wells and lakes and chemical and bacteriological analyses are reported for Lake County, Florida, from May 1971 to May 1972. Stream discharge records are reported on a water year basis; stream-discharge records are presented for the 1971 water year (October 1, 1970 to September 30, 1972). The flow of Big Creek near Clermont and Palatlakaha River at Cherry Lake Outlet was very low for the 1971 water year (9% and 14%, respectively) compared to the long-term average. The long-term, month-end hydrographs show that lake levels were the highest of record in 1960 and lowest in 1962. The levels in the lakes of the Apopka chain were generally near normal throughout 1971and near normal or above during the first part of 1972. Most groundwater withdrawn in the county is from the Floridan aquifer. Water levels in the Floridan aquifer in May 1972 were generally higher than in May 1971. However, in the northern part of the county and also in the Mascotte-Groveland area, the water levels were down. Three streams, 5 lakes, and 8 clastic-aquifer wells are sampled annually for chemical analyses under this program. In addition, water-quality data are available for 2 streams and 9 lakes in the county from other Geological Survey cooperative programs. The chemical analyses are tabulated. (Woodard-USGS)
W73-12949

2F. Groundwater

ANALYSIS OF SEEPAGE INTO GROUND--WATER SYSTEM,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-12412

ENVIRONMENTAL ISOTOPES AND CIRCULATION IN AQUIFERS UNDER VENICE (ISOTOPES DU MILIEU ET CIRCULATIONS DANS LES AQUIFERES DU SOUS-SOL VENITIEN),
Turin Univ. (Italy). Istituto di Geologia e Paleontologia.
G. Bortolami, J-C. Fontes, and C. Panichi.
Earth and Planetary Science Letters, Vol 19, No 2, p 154-167, June 1973. 4 fig, 18 ref.

Descriptors: *Groundwater movement, *Water circulation, *Artesian aquifers, *Confined water, *Recharge, Stable isotopes, Carbon radioisotopes, Hydrogeology, Karst, Karst hydrology.
Identifiers: *Italy (Venice).

The subsidence of the plain of Venice (about 1 cm/yr) is caused by overexploitation of deep artesian aquifers. Stable isotopes show the existence of two groups of deep waters both correlated to a cold climatic recharge. These waters are clearly different from those of the unconfined shallower aquifers. The deep waters are recharged in the basins of the Prealpine rivers. Brenta and Piave, in the paleochannel of the alpine river Adige. The waters of Prealpine type are located under the main part of the plain. The waters coming from the Prealpine area exhibit relatively high tritium contents (85 to 120 TU) and rather low C-14 activities (60% to 70%). The dissolved carbon has not undergone any significant exchange with solid carbonates. The circulation is rapid in the recharge areas where the waters circulate in the hydrographic network of the karstic system of the Prealps. In the lower parts of the plain the flow velocities are low and decrease eastward and downward from 3 m/yr to 1 m/yr. It is possible that a drastic reduction of these velocities occurs in the western part of the plain due to a major sedimentological discontinuity, such as the western limit of the marine deposits. (Knapp-USGS)
W73-12419

SELECTED DATA ON WELLS IN THE BARSTOW AREA, MOJAVE RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 04B.
W73-12421

GEOHYDROLOGY OF THE DOVER AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-12425

ESTIMATION AND FORECAST OF WATER LOSSES DURING A SPRING FLOOD TO GROUNDWATER RECHARGE FOR WATERSHEDS IN NORTHWESTERN EUROPEAN USSR BASED ON DATA OF THE VALDAY FIELD LABORATORY (OTSENKA I PROGNOZ POTER' VODY V PERIOD VESENNE GO POLOVOD'YA NA POPOLNENIYE ZAPASOV GRUNTOVYKH VOD DLYA VODOSBOROV SEVERO-ZAPADA YETS (PO MATERIALAM VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. I. Kapotova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 62-74, Leningrad, 1972. 7 fig, 6 tab, 4 ref.

Descriptors: *Water loss, *Groundwater recharge, *Floods, *Watersheds (Basins), *Forecasting, Estimating, Water storage, Water table, Water equivalent, Snowmelt, Runoff, Spring, Variability, Curves.
Identifiers: European USSR, *Valday Field Laboratory.

Groundwater recharge during a spring flood is defined as the difference in groundwater storage at the beginning and end of the flood. At the beginning of a flood, groundwater storage in the Valday Hills varies in individual years between 50 mm and 100 mm (coefficient of variation is 0.22). At the end of a flood, groundwater storage averages 120 mm and varies slightly from year to year (coefficient of variation is 0.03). Water losses average 50 mm and vary annually between 25 mm and 65 mm (coefficient of variation is 0.22). At the beginning of a flood, groundwater storage in individual plots for different years varies between 10 mm and 160 mm and at the end of a flood, between 50 mm and 240 mm. Water losses on individual plots vary between 0 mm and 150 mm. Recommendations are given for a 2-3 month advance forecast of water losses to groundwater recharge for consideration in preparing forecasts of spring runoff in northwestern European Russia. (See also W73-12435) (Josefson-USGS)
W73-12439

PHYSICAL CHARACTERISTICS OF BASALT AQUIFERS,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04B.
W73-12523

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS, VOLUME II,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 05E.
W73-12576

GROUND-WATER RESOURCES, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
J. S. Downey.
North Dakota State Water Commission County Ground-Water Studies 17, Part 3, and North Dakota Geological Survey Bulletin 57, Part 3, 1973. 25 fig, 4 plate, 5 tab, 60 ref.

Descriptors: *Groundwater resources, *Water wells, *Water supply, *North Dakota, Well data, Aquifer characteristics, Water yield, Water quality, Specific capacity, Transmissivity, Groundwater movement, Hydrogeology, Water level fluctuations.
Identifiers: *Nelson and Walsh Counties (N DAK).

Nelson and Walsh Counties, North Dakota, are underlain by bedrock of Ordovician, Jurassic, and Cretaceous age. The Fall River and Lakota Formations (Dakota aquifer) and the Pierre Formation of Cretaceous age contain the principal bedrock aquifers. The Dakota aquifer, which consists of sandstone, may yield more than 500 gpm at selected locations. The Pierre aquifer, which consists of fractured shale, yields from 1 to 5 gpm. Water from both aquifers is of poor quality, but usable. The Jurassic and Ordovician aquifers yield a sodium chloride type water that is very saline. Yields greater than 500 gpm may be locally available from the Ordovician aquifers. The Spiritwood, McVille, and Fordville glacial-drift aquifers are capable of yielding more than 500 gpm of fair to good quality water. Several smaller drift aquifers--the Edinburg, Medford, and beach deposits--supply water of good to poor quality. The eastern part of Walsh County is the discharge area for a deep regional groundwater flow system that originates in the high parts of Cavalier, Nelson, and Walsh Counties and areas to the west. Water moving in this flow system becomes more saline and becomes a sodium chloride type as it moves to the discharge area. Saline lakes occur in eastern Walsh County as the result of natural artesian discharge from the deep groundwater flow system. Six communities in the project area use groundwater supplies. (Woodard-USGS)
W73-12578

GEOLOGY OF NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
J. P. Bluemle.
North Dakota Geological Survey Bulletin 57, Part 1, and North Dakota State Water Commission County Ground Water Studies 17, Part 1, 1973. 30 fig, 4 plate, 52 ref.

Descriptors: *Geology, *Groundwater, *Aquifers, *North Dakota, Natural resources, Land use,

Construction, Foundations, Topography, Surveys, Mapping, Bedrock, Glacial sediments, Economics, Construction materials, Gravels.
Identifiers: *Nelson and Walsh Counties (N Dak).

Nelson and Walsh Counties are located in northeastern North Dakota on the Eastern edge of the Williston basin. Precambrian rocks range in depth from 300 to 2,800 feet. They are overlain by Paleozoic and Mesozoic rocks that dip to the west at low angles. Glacial drift covers the entire area except along a few deeply eroded valleys where Cretaceous shale is exposed. The glacial drift reaches a maximum thickness of over 300 feet in the McVille trench of southern Nelson County. Economic mineral deposits include sand and gravel of the beach ridges and river terraces and groundwater and surface water. Although no commercial hydrocarbon production has yet been found, the many possibilities for stratigraphic and structural traps along with shallow drilling depths allowing easy and fast drilling sould do much to promote exploration in the area. The glacial deposits form the major aquifers in the prospect area. Detailed geologic maps of the two-county area are included. The information should be of value to anyone interested in the distribution of the geologic units that have potential as aquifers. Data are also supplied on the engineering properties of foundation materials at possible construction sites. (Woodard-USGS)
W73-12579

PRESIDIO BOLSON, TRANS-PECOS TEXAS AND ADJACENT MEXICO: GEOLOGY OF A DESERT BASIN AQUIFER SYSTEM,
Texas Univ., Austin.
C. G. Groat.
Bureau of Economic Geology Report of Investigations No 76, 1972. 46 p, 20 fig, 56 ref.

Descriptors: *Hydrogeology, *Bolsons, *Texas, *Alluvium, *Groundwater basins, Stratigraphy, Sedimentology, Mexico, Geomorphology, Gravels, Erosion, Aquifers.
Identifiers: *Presidio (Tex).

The Presidio Bolson in Texas and Mexico is one of several mountain-bounded basins in the Mexican Highlands section of the Basin and Range physiographic province. Mountain-bounded basins or bolsons are the most important aquifer systems throughout most of southwestern and western United States and northern Mexico. The dissection of the Presidio Bolson by the Rio Grande and its tributaries has afforded an ideal situation for detailed study of the stratigraphy of one of these important aquifer systems. The basin is filled with detritus from the surrounding mountains. Poorly sorted conglomerate and interbedded sandstone deposited on alluvial fans characterize the basin-margin facies; gypsiferous mudstone and fine sandstone of the basin-center facies (the greatest volume of deposits) were deposited on the toes of alluvial fans and in playa lakes. Groundwater is the most valuable resource in the basin. The most reliable supplies are obtained from Rio Grande alluvium south of the juncture with the Rio Conchos. Sidestream alluvium yields small quantities of water in a few places. The bolson fill is potentially the most important aquifer, but the large plug of impermeable, gypsiferous mudstone results in small yields of poor-quality water over much of the bolson. (Knapp-USGS)
W73-12585

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
For primary bibliographic entry see Field 04B.
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12719

CONVECTIVE GROUND WATER FLOW,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
J. Eliasson.
Series Paper No 3, 1973. 107 p, 30 fig, 11 tab, 23 ref.

Descriptors: *Convection, *Groundwater movement, Porous media, Boundary processes, Mathematical studies, Computer programs, Mass transfer, Heat transfer, Heat flow, Turbulence.

Convective groundwater flow and related phenomena may be investigated by two methods that are different both in principle and applicability. The first method is the linear method. The criterion for its application is that the departures of temperatures and velocities from their mean values are so small that terms quadratic in these quantities can be neglected. The linear method is applicable to subcritical flow and to analysis of the stability of stationary flows. When the initial instabilities have grown big enough, the linear flow is replaced by nonlinear convection where interactions between flow on different frequencies is predominant. In the two-dimensional case, when the flow is a system of horizontal rectangular rolls, this interaction between the frequencies can be written in terms of the Fourier transform of the temperature function or the stream function. (Knapp-USGS)
W73-12722

GROUND WATER MODELS WITH PARALLEL LINEAR RESERVOIRS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
J. Eliasson, S. Arnalds, S. Johannsson, and S. P. Kjaran.
Series Paper No 1, 1973. 53 p, 19 fig, 5 tab, 6 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Unsteady flow, *Water level fluctuations, Mathematical models, Computer programs, Boundary processes, Artesian aquifers, Surface-groundwater relationships.

Unsteady groundwater flow in an aquifer of limited horizontal extent and arbitrary boundary shape may be described by the differential equation of heat conduction, the solution of which includes the solving of an eigenvalue problem by a numerical method. Boundary conditions are provided by nature in the form of watertight formations, rivers, lakes, or any other kind of constant hydraulic head connected to the aquifer. Discharge is the sum of the flow through infinitely many linear reservoirs, corresponding to the eigenfunctions. The resulting equations for groundwater level and discharge are sums of convolution integrals of the infiltration, an easy process to handle in a digital computer. The mathematical model derived was used to analyze the inflow into a water reservoir in Iceland from a nearby lavafield, and the runoff is compared with flow data. (Knapp-USGS)
W73-12723

ARTIFICIAL RECHARGE OF GROUNDWATER AND INFILTRATION BASINS (ISKUSSTVENNOYE VOSPOLNENIYE ZAPASOV I INFIL'TRATSIONNYYE VODOZABORY PODZEMNYKH VOD),
For primary bibliographic entry see Field 04B.
W73-12745

SILICA IN THERMAL AND COLD WATERS (KREMNEZEM V TERMAL'NYKH I KHOLODNYKH VODAKH),
For primary bibliographic entry see Field 02K.
W73-12751

WATER LEVELS NEAR A WELL DISCHARGING FROM AN UNCONFINED AQUIFER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12777

NEW APPLICATIONS OF GEOPHYSICAL METHODS TO GROUND-WATER PROBLEMS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park.
K. H. Merkel, S. S. Alexander, R. J. Greenfield, and P. M. Lavin.
Earth and Mineral Sciences, Vol 41, No 5, p 33-37, February 1972. 4 fig, 7 ref.

Descriptors: *Borehole geophysics, Electric well logging, Electrical studies, *Resistivity, Aquifer characteristics, *Water pollution sources, Wells, *Mine water, *Pennsylvania, Landfills.
Identifiers: *Fracture traces, Fluid saturated soil layer, Zone of mineralization, Primary flow chemicals.

Traditionally, geophysical exploration has been associated mainly with the petroleum and mining industries. The use of seismic, gravity and magnetic exploration methods in the search for oil and gas, and the use of electric, magnetic and gravity techniques in the search for metallic mineral deposits are well established. To a lesser extent, various geophysical surveying procedures have been applied to ground-water exploration; recently, fostered by increased consumption of resources and greater awareness for environmental problems, new problems have arisen which have led to new and more sophisticated applications of geophysical techniques. Case studies are presented on the use of geophysical techniques in the areas of direct and indirect ground-water source exploration, location of sources of acid mine drainage and other ground water pollutants. Emphasis is placed on the development of new procedures introduced to overcome some of the problems which have limited the applications of conventional geophysical methods utilized in shallow depth exploration in the past. (Campbell-NWWA)
W73-12783

EVALUATION OF A SHALLOW LEAKY WATER TABLE AQUIFER IN A SUBHUMID REGION OF FRANCE,
M. A. Saint-Pe.
Ground Water, Vol 11, No 4, p 23-39, July-August 1973. 5 fig, 6 ref.

Descriptors: *Hydrogeology, *Groundwater resources, Water table, Groundwater movement, Water balance, Evapotranspiration, Recharge, Discharge (Water), Water yield, Drainage.
Identifiers: *Leaky aquifers, France.

The Arcachon Bay Plio-Quaternary aquifer, located in a flat poorly drained region of France, receives 1 m annual precipitation, and has a shallow water table. It is composed of a 50-100 m thick body of well-sorted clean sand and gravel which has excellent hydrodynamic properties and much fresh groundwater in storage. Leakage to the underlying Miocene aquifer, inferred from geologic and hydrogeologic observations, was calculated by water budgeting and Darcy's law to be on the order of 1.5 cu m/sec. This rate, about 15% of the annual precipitation, is nearly half the recharge rate to the Plio-Quaternary aquifer. Recharge amounts to more than 35% of the annual precipitation. The evapotranspiration rate, based on Thornthwaite's method, is more than 55% of the

annual precipitation. High recharge and evapotranspiration rates, a direct consequence of the relief, permeability of soils, and occurrence of hot summers, are coupled with a low surface runoff. The aquifer is excellent for irrigation and water-supply purposes. Drainage improvement is needed for extensive farming of the lands. (K-napp-USGS)
W73-12941

AN APPROACH TO HYDROGEOLOGIC INVESTIGATIONS OF RIVER ALLUVIUM BY THE USE OF COMPUTERIZED DATA PROCESSING TECHNIQUES,
Oklahoma State Univ., Stillwater. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-12942

HYDRAULICS OF SHEETLIKE SOLUTION CAVITIES,
Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.
For primary bibliographic entry see Field 04B.
W73-12944

2G. Water in Soils

AQUEOUS IRON-SULFUR SYSTEMS IN RICE FIELD SOILS OF LOUISIANA,
Alabama Univ., Birmingham. Inst. of Dental Research.
For primary bibliographic entry see Field 03F.
W73-12385

PROBLEMS IN THE PRODUCTION OF A SPRING FLOOD (VOPROSY FORMIROVANIYA VESENNEGO POLOVOD'YA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W73-12435

INVESTIGATION OF THERMAL PROPERTIES OF SOILS IN THE DON RIVER BASIN FOR ESTIMATION OF SNOWMELT LOSSES TO INFILTRATION INTO FROZEN SOIL (ISSLEDOVANIYE TEPLOVYKH SVOYSTV POCHV BASSEYNA R. DONA DLYA OTSENKI POTER' TALYKH VOD NA IN FIL'TRATSIYU V MERZLUYU POCHVU),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Ye. F. Golitsyna, I. L. Kalyuzhnyy, K. K. Pavlova, and V. V. Romanov.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 3-21, Leningrad, 1972. 6 fig, 4 tab, 16 ref.

Descriptors: *Soils, *Frozen soils, *Thermal properties, *Snowmelt, *Infiltration, Water loss, Moisture deficit, Soil moisture, Moisture content, Temperature, Thermal conductivity, Ice, Chernozems, Forest soils, Soil properties, Equations.
Identifiers: USSR, *Don River, Nomograms.

Data are presented on thermal properties of Don soils and on the phase composition of water in these soils in the frozen state. The process of infiltration is examined in terms of the mechanism of interaction of snowmelt with frozen soil, and the thermophysical method used to compute water losses to infiltration is reduced to practical use. In loam Chernozems of the Don River basin, intense phase transitions are generally observed at temperatures ranging from 0 to minus 3 deg C, while at temperatures below minus 5 deg C, the change in the ratio of ice to unfrozen water is negligible. At temperatures between minus 15 and minus 20 deg C, the amount of unfrozen water in Chernozems is 10%-16% of the weight of dry soil. (See also W73-12435) (Josefson-USGS)
W73-12436

LABORATORY INVESTIGATIONS OF THE TRANSMISSION CAPACITY OF FROZEN AND THAWED SOILS BASED ON DATA OF THE VALDAY FIELD LABORATORY (VNIGL) (LABORATORNYYE ISSLEDOVANIYA VODOPROPUSKNOY SPOSOBNOSTI MERZLYKH I TALYKH POCHVO-GRUNTOV (PO MATERIALAM MERZLOTHOY LABORATORII VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. A. Kapotov.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 22-45, Leningrad, 1972. 6 fig, 2 tab, 11 ref.

Descriptors: *Laboratory tests, *Frozen soils, *Thawing, *Infiltration, *Percolation, Hydraulic conductivity, Permeability, Porosity, Soil moisture, Moisture content, Temperature, Heat, Freezing, Melt water, Bound water, Loam, Chernozems, Curves, Equations, Laboratory equipment.
Identifiers: USSR, *Valday Field Laboratory, *Transmission capacity.

Investigations were conducted at the Valday Field Laboratory in 1968-71 to measure infiltration and percolation of water into thawed and frozen sandy and Chernozem loam soils. Large infiltration and percolation values were recorded in experiments at temperatures ranging from minus 3.0 to 3.5 deg C in upper layers of a sandy soil wetted to minimum moisture capacity. Similar results were obtained in experiments with Chernozem loam soils at temperatures ranging from minus 2.2 to 2.4 deg C. The data obtained can be used to assess the importance of factors which determine infiltration capacity of soils. (See also W73-12435) (Josefson-USGS)
W73-12437

PRINCIPLES FOR ESTIMATING AND FORECASTING WATER LOSSES IN SPRING ON WATERSHEDS IN NORTHWESTERN EUROPEAN USSR (PRINTSIPY OTSENKI I PROGNOZA POTER' VESENNIKH VOD NA VODOSBORAKH SEVERO-ZAPADA YETS),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. I. Krestovskiy.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 46-61, Leningrad, 1972. 7 fig, 3 tab, 30 ref.

Descriptors: *Water loss, *Water storage, *Watersheds (Basins), *Estimating, *Forecasting, Recharge, Groundwater, Water balance, Precipitation (Atmospheric), Evaporation, Runoff, Floods, Lakes, Bogs, Soils, Spring, Curves, Equations.
Identifiers: European USSR.

Fundamental principles for estimating absorptive capacity of watersheds were based on analysis of long-term observation data on components in the water balance of river basins in northwestern European Russia for fall, winter, and spring seasons of the year. Methods are proposed for forecasting water losses to basin recharge during periods of spring floods. The principles examined are generally applicable to other forested regions in the area. (See also W73-12435) (Josefson-USGS)
W73-12438

RESULTS OF A STUDY OF WATER REGIME OF SOILS ON SMALL WATERSHEDS IN THE DON RIVER BASIN (REZUL'TATY IZUCHENIYA VODNOGO REZHIMA POCHV MALYKH VODOSBOROV V BASSEYNE R. DONA),
Gosudarstvenni Gidrologicheskii Institut, Leningrad (USSR).
Ye. A. Leonov, and N. Ye., Leonova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 133-154, Leningrad, 1972. 4 fig, 4 tab, 13 ref.

Descriptors: *Soil moisture, *Water storage, *Small watersheds, Moisture content, Snow surveys, Antecedent moisture content, Field capacity, Variability, Equations.
Identifiers: USSR, *Don River.

Studies were made of water regime of soils on small watersheds in the Don River basin to Kazanskaya Station between August 1969 and May 1971. Large temporal and spatial variability of soil moisture storage is due to a great diversity of physiographic conditions in the basin. Standard deviation of spatial variability of moisture storage in the top meter layer of soil for small watersheds of the Central Russian upland for winter and spring periods is 65-70 mm, and the coefficient of variation is 0.19-0.20. Standard deviation of spatial variability of soil moisture on 3-km snow courses with homogeneous soils is 15-20 mm, and the coefficient of variation is 0.04-0.07. For snow courses with heterogeneous soils, standard deviation is 25-77 mm, and the coefficient of variation is 0.06-0.21. The present basin network of 29 stations under supervision of the Administration of the Hydrometeorological Service of the Central Black Earth region does not provide for uniform distribution of stations for observation of major soil groups or for sufficiently accurate determination of average basin moisture storage. To improve the determination accuracy, soil moisture observations must be expanded to include villages of Russkaya Zhuravka, Istobnoye, Gremyach'ye, Demshinsk, Volchek, Terbuny, and Bogoyavlensk and towns of Bobrov, Georgiu-Dezh, and Zadonsk. (See also W73-12435) (Josefson-USGS)
W73-12441

SOME HYDROPHYSICAL CHARACTERISTICS OF SOILS IN THE DON RIVER BASIN TO KAZANSKAYA STATION (NEKOTORYYE VODNO-FIZICHESKIYE KHARAKTERISTIKI POCHV BASSEYNA R. DONA DO ST-TSY KAZANSKOY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Ye. A. Leonov, and N. Ye. Leonova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 183-207, Leningrad, 1972. 3 fig, 13 tab, 15 ref.

Descriptors: *Soils, *Soil physical properties, *Hydrologic properties, *Bulk density, *River basins, Small watersheds, Soil moisture, Moisture content, Wilting point, Particle size, Porosity, Water storage, Chernozems, Forest soils, Grasslands.
Identifiers: USSR, *Don River, Hygroscopicity, Solonetzes.

To study hydrophysical properties of dominant and subsidiary soils in the Don River basin to Kazanskaya Station, 101 bulk-density determinations were made in 1969-71 at 44 stations in 8 small watersheds. Average bulk-density values for dominant soils increase in a southerly direction, with lowest values in the top-meter layer observed in podzolized and leached Chernozems and highest values in southern Chernozems. In each soil region, bulk density of the dominant soils is lower than bulk density of the subsidiary soils, the difference in the top-meter layer reaches 0.40-0.50 g/cu cm. Bulk-density values for gray and dark-gray Forest soils on Chernozem and for Chernozems beneath forest plantings differ little from

those for dominant soils of the corresponding region. (See also W73-12435) (Josefson-USGS)
W73-12443

METHODS OF DETERMINING SOIL MOISTURE STORAGE IN WINTER (K METODIKE OPREDELENIYA VLAGOZAPASOV POCHVY V ZIMNIY PERIOD GODA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
L. K. Vershinina, and N. A. Ivanova.
In: Voprosy formirovaniya vesennego polovod-'ya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, p 208-217, Leningrad, 1972. 4 fig, 2 tab, 9 ref.

Descriptors: *Soil moisture, *Water storage, *Winter, Moisture content, Field capacity, Bulk density, Water equivalent, Ice, Runoff, Frozen soils, Thawing, On-site investigations, Snow surveys.
Identifiers: USSR, *Bityug River.

Determinations of soil bulk density and moisture storage were based on data of on-site investigations by the State Hydrologic Institute in the Bityug River basin in Voronezh Oblast in the winter of 1968-69. Errors in the determination of moisture storage of frozen soils were estimated on the basis of bulk density of thawed soils. To determine moisture storage of frozen soils in the region, the relation of bulk density of thawed and frozen soils to moisture content should be used. (See also W73-12435) (Josefson-USGS)
W73-12444

TIME EFFECTS ON DYNAMIC SHEAR MODULUS OF CLAYS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. F. Marcuson, III, and H. E. Wahls.
J Soil Mech Found Div, Am Soc Civ Eng, Vol 98, No SM12, p 1359-1373, Dec 1972. 9 fig, 1 tab, 19 ref, 2 append

Descriptors: *Soil dynamics, Clays, Time, *Soil tests, Soil properties, Soil mechanics, Equations, Dynamics, Bibliographies.
Identifiers: *Shear modulus, Dynamic response, Dynamic tests, Test results.

The dynamic properties of soils are needed for computing response to seismic forces. A Hardin oscillator was used to apply a steady-state, torsional vibratory load to remolded specimens of kaolinite and calcium bentonite inside a triaxial chamber and under an isotropic consolidation pressure. Principles of the resonant column test were used to determine dynamic shear modulus. After completing primary consolidation, the response was studied as a function of time for both drained and undrained conditions. Regression analyses were performed on these data and relationships are presented that show the effects of void ratio, effective stress, and time on the dynamic response of the 2 clays. The shear modulus increases with: (1) increasing pressure, (2) decreasing void ratio, and (3) time, for both materials. This increase was approximately 5% for kaolinite and 25% for bentonite per logarithmic cycle of time after completion of primary consolidation in constant effective stress undrained tests. (USBR)
W73-12477

IMPROVEMENTS IN MOVING SPRINKLER IRRIGATION SYSTEMS FOR CONSERVATION OF WATER,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-12507

THEORY OF WATER MOVEMENT IN SOILS: 10. CAVITIES WITH CONSTANT FLUX,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
J-Y. Parlange.
Soil Science, Vol 116, No 1, p 1-7, July 1973. 14 ref.

Descriptors: *Soil water movement, *Pores, Porosity, Interstices, Mathematical studies, Equations, Porous media, Hydraulic conductivity, Diffusivity, Infiltration, Flow.

Analytical expressions are derived for the absorption of water from cylindrical and spherical cavities when the flux of water at the cavity is imposed. The solution reduces to the one-dimensional case in the short time limit. The soil around the cavity may become saturated; the growth of the saturated region with time is described. Correction terms due to gravity are also derived for the case of a spherical cavity. (See also W73-05099) (Knapp-USGS)
W73-12600

ERODIBILITY OF HILL SOILS OF SUTLEJ CATCHMENT AREA IN HIMACHAL PRADESH,
Indian Agricultural Research Inst., New Delhi. Div. of Soil Science and Agricultural Chemistry.
For primary bibliographic entry see Field 02J.
W73-12635

EFFECTS OF AIR GAPS AND SATURATED VOIDS ON ACCURACY OF NEUTRON MOISTURE MEASUREMENTS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
B. Z. Richardson, and E. R. Burroughs, Jr.
U S For Serv Res Pap Int. 120. p 1-20. 1972. Illus.
Identifiers: *Air gaps, *Measurements, Moisture, Sand, Saturated, Voids, *Soil moisture.

The effects of voids on the accuracy of neutron soil moisture measurements in coarse and fine sand were investigated utilizing 2 25-cubic-foot plastic tanks. Test voids 3 inches and 6 inches in diameter and 10 inches long were cut from aluminum tubing and fastened to the neutron access tube in each tank. Voids in the control tank were filled with sand; those in the test tank were left empty. The amount of water which was added or subtracted was measured by weighing each tank. The difference in neutron measurements between the 2 tanks with the water at a given level measures the effects of the voids. A maximum error of +55% moisture by volume was caused by the large void in coarse sand with the void saturated; with the void drained, the error was -12.3% moisture. Errors in fine sand were slightly less than those in coarse sand; and errors due to the small void were about 1/3 the magnitude of errors due to the large void. Graphs were developed for use in estimating the size of voids adjacent to access tubes and in calculating the probable magnitude of measurement errors due to these voids when using field data.--Copyright 1973, Biological Abstracts, Inc.
W73-12636

APPLICATION OF ACRYLIC PLASTIC TENSION LYSIMETERS TO SLOPING LAND,
British Columbia Univ., Vancouver. Dept. of Soil Science.
W. W. Bourgeois, and L. M. Lavkulich.
Can J Soil Sci. Vol 52, No 2, p 288-290. 1972. Illus.
Identifiers: *Lysimeters, *Sloping land, Instrumentation, *Soils.

A lysimeter was developed with a desirable hydraulic contact between the extracting plate and the soil, using silicon carbide powder. A detailed description of the materials and construction is provided.--Copyright 1973, Biological Abstracts, Inc.
W73-12638

THE EFFECT OF ADSORBENTS ON THE RATE OF DEGRADATION OF HERBICIDES INCUBATED WITH SOIL,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-12656

FACTORS AFFECTING THE PERCOLATION TEST,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-12716

INFLUENCE OF MOISTURE REGIME ON THE GENESIS OF LATERITE SOILS IN SOUTH INDIA: II. CLAY COMPOSITION AND MINERALOGY,
Indian Agricultural Research Inst., New Delhi.
A. S. Gowaikar.
J Indian Soc Soil Sci. Vol 20, No 1, p 59-66. 1972. Illus.
Identifiers: *Clay composition, Genesis, *India, Mineralogy, Soil moisture, Rainfall, *Soils (Laterite).

The chemical composition of the clay fractions indicates reduction in SiO2 and increase in Fe2O3 and Al2O3 with increase in rainfall. The clay minerals present are dominated by kaolinite under all moisture regimes. Quartz is also noted in small quantities in all clay fractions irrespective of the climatic conditions. Gibbsite occurs both in high and excessive rainfall groups. Laterization process is enhanced with high and excessive rains in 7 mo. having a K index > 1. With high rains distributed over a period of 9 mo., the laterization process is retarded. A dry spell of about 5 mo. (K index < 1) appears to be essential for laterization. (See also W73-04605)--Copyright 1973, Biological Abstracts, Inc.
W73-12721

CHARACTERISTICS OF WATER MIGRATION IN A THICK LEACHED CHERNOZEM (OSOBENNOSTI DVIZHENIYA VODY V VYSHCHELOCHENNOM MOSHCHNOM CHERNOZEME),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Maslichnykh i Efiromaslichnykh Kultur, Krasnodar (USSR).
P. G. Semikhnenko, and V. I. Kondrat'yev.
Pochvovedeniye, No 6, p 69-74, June 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Soil physics, *Soil water movement, *Soil moisture, *Chernozems, Capillary action, Diffusion, Evaporation, Water loss, Precipitation (Atmospheric), Soil management.
Identifiers: *USSR (Krasnodar Territory-Kuban').

Results are presented of experiments performed in the Kuban' region (Krasnodar Territory) in 1966-69 on low-humic, thick-leached Chernozems formed on calcareous loesslike loam. The capillary rise of water to the surface of this soil does not compensate for water losses through evaporation. Capillary flow to the soil surface is observed only during the first days of spring and after abundant precipitation when soil water content approaches minimum moisture capacity. The upper (2-4 cm) layer of well-structured soils dries rapidly to discontinuous capillary moisture or less and acts as a mulch. From the first days of spring the evaporation zone moves downward, and water losses during the presowing period are determined mainly by vapor migration through diffusion. (Josefson-USGS)
W73-12743

HYDROPHYSICAL PROPERTIES AND WATER REGIME OF CRIMEAN SOUTHERN CHERNOZEMS IN A FIELD CROP ROTATION (VOD-

NO-FIZICHESKIYE SVOYSTVA I VODNYY REZHIM YUZHNYKH CHERNOZEMOV KRYMA V POLEVOM SEVOOBOROTE),
Krymskii Selskokhozyaistvennyi Institut, Simferopol (USSR).
G. S. Smorodin, and V. V. Parshikov.
Pochvovedeniye, No 6, p 57-68, June 1972. 2 fig, 7 tab, 8 ref.

Descriptors: *Soil physical properties, *Hydrologic properties, *Chernozems, *Rotations, *Field crops, Crop production, Plant growth, Soil-water-plant relationships, Root zone, Soil water, Soil moisture, Available water, Permeability, Evapotranspiration, Water loss, Clays, Loam, Particle size.
Identifiers: *USSR (*Crimea).

For many years technologically advanced kolkhozes and sovkhozes in the Crimea have obtained high yields of winter wheat and barley, amounting to 35-45 cntr/ha. To determine the causes of these yields, investigations were carried out in 1966-69 to study hydrophysical properties and moisture conditions of southern Chernozems in the Crimean piedmont-steppe zone. These soils have a high moisture capacity and permeability, a high available-water content (300-360 mm in the 0- to 200-cm layer), and a relatively high content of water-stable aggregates. Agroclimatic conditions contribute to deep soil wetting in fall and winter (to a depth of 200 cm or more). Loss of soil water by evaporation is high (5.2 to 7.4 mm/day), especially in summer when soil water content is optimal and plant growth is intense. Evaporation from bare soil may reach 1.3 mm/day. Total loss of water by field crops may exceed soil evaporation fivefold to sixfold. (Josefson-USGS)
W73-12744

WATER REGIME IN A CROP ROTATION ON CHERNOZEM SOILS IN SOUTHEAST RUSSIA (VODNYY REZHIM V SEVOOBOROTE NA CHERNOZEMNYKH POCHVAKH YUGO--VOSTOKA),
A. M. Byalyy.
Gidrometeoizdat, Leningrad, 1971. 232 p.

Descriptors: *Soil water movement, *Soil moisture, *Chernozems, *Rotations, *Soil-water-plant relationships, Soil management, Soil temperature, Root zone, Available water, Evapotranspiration, Wilting point, Water utilization, Water loss, Water supply, Water balance, Precipitation (Atmospheric), Condensation, Snow, Runoff, Shelterbelts.
Identifiers: *European USSR, Hygroscopicity.

Water regime of Chernozem soils in southeastern regions of European Russia was investigated for relationships between incoming and outgoing items in the water balance and for characteristics of water supply and use as they affect plant growth in different crop rotation fields. Studies are made of soil moisture conditions in forests, shelterbelts, and open fields between trees, and principal factors in the regulation of the water regime of Chernozems are described. A comprehensive bibliography of Soviet references is supplied. (Josefson-USGS)
W73-12747

DETERMINATION OF EXCHANGEABLE CATIONS IN CALCAREOUS SOILS,
Centro de Edafologia y Biologia Aplicada del Segura, Murcia (Spain).
O. Carpena, A. Lax, and K. Vahtras.
Soil Science, Vol 113, No 3, p 194-199, March 1972. 3 fig, 2 tab, 6 ref.

Descriptors: *Cation exchange, *Calcareous soils, *Calcium carbonate, *Magnesium carbonate, *Alkaline earth metals, Soil analysis, Soil chemistry, Soil investigations, Leaching, Solvent extractions.
Identifiers: *Spain (Murcia).

This investigation attempted to eliminate solubilization of carbonates as a source of interference in the determination of exchangeable cations in calcareous soils. All procedures for determining exchangeable cations in calcareous soils have the problem of interference of alkali-earth metals dissolved from carbonates, which are exchangeable cations. In 1953, Mehlich introduced a procedure which determines the exchangeable cations in calcareous soils by measuring the calcium and magnesium dissolved from soil carbonates when the soils were extracted with reagents. This procedure is most appropriate for these soils, because the solubility of carbonates is lower in this extractant than in any other. The results are amply supported with tables and graphs. (Bahre-Arizona)
W73-12786

LEACHING SALTY SOILS,
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and D. R. Bhumbla.
Indian Farming, Vol 22, No 1, p 10-11, 1972. 4 fig.

Descriptors: *Leaching, *Gypsum, *Permeability, *Land forming, *Saline soils, Drainage, Ponding, Farm ponds, Root zone, Soil moisture, Soil amendments, Crop response, Alkaline soils.
Identifiers: *India (Haryana-Punjab-Pradesh).

Uncultivated lands in the states of Haryana, Punjab and Uttar Pradesh in India, contain excess salts and sodium, and unless removed from the soil, crop response is likely to be poor. The ideal method for removal of salts is to provide drainage in the root zone so that salts can be removed by a drainage system to the sea. Leaching of salts to lower soil layers can be accomplished by ponding water on the soil surface preceding the rainy season. This is the time when maximum salts are on the soil surface and the groundwater table is deepest. The relatively dry soil ensures a high level of soil permeability so that water is not lost by evaporation. Impermeable soils are aided by the addition of gypsum which facilitates water penetration and therefore salt leaching. It is suggested for this area that nearby canal water be used because of its good quality, and if not available, tubewells should be installed. (Bahre-Arizona)
W73-12789

AUGER SOIL SAMPLER FOR HERBICIDE RESIDUES,
Agricultural Research Service, College Station, Tex. Plant Science Research Div.
T. O. Flynt, T. E. Riley, R. W. Bovey, and R. E. Meyer.
Weed Science, Vol 19, No 5, p 583-587, September 1971. 2 fig.

Descriptors: *Sampling, *Soil moisture, *Soil analysis, *Herbicides, Soil investigations, *Instrumentation, Soil tests, *Texas, Soil types.

A soil sampler was constructed for moisture and pesticide residue determinations that will retrieve soils with rocky and heavy clay layers from Texas rangeland. A commercially constructed worm-gear driven auger was mounted in a 3.7-m-tall vertical rectangular frame supported by a 4.6-m-long A-frame attached to the rear bumper of a truck. A cable attached from the bed of the truck to the top of the frame permits the entire assembly to be raised off the ground with a hand lift hoist when moving from plot to plot. The power unit for the auger was suspended halfway from the A-frame with a flat metal bar. A cable from this suspension bar to a guide platform on the vertical frame prevents any stress on the flexible shaft from the motor to the worm gear drive on the auger. The depth, speed, accuracy and ease of sample retrieval were substantially increased, compared to manual sampling. (Gloyd-Arizona)
W73-12794

SODIUM-AFFECTED SOILS IN THE JORDAN VALLEY,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Soil Physical Chemistry.
N. Alperovitch, and J. Dan.
Geoderma, Vol 8, No 1, p 37-57, August 1972. 5 fig, 24 ref.

Descriptors: *Water table, *Water levels, *Soil types, *Saline soils, *Alkaline soils, Aeolian soils, Alluvium, Bogs, Soil tests, Salts, Sodium, Soil classification, Groundwater availability, Leaching, Precipitation (Atmospheric).
Identifiers: *Jordan Valley.

Formation of fine-textured aeolian, alluvial and swampy soils, found both on the present depositional surfaces and the older dissected terrace, is presented to illustrate in part the quaternary history of the region. High water tables affect the salinity and high levels of exchangeable sodium in soils, while some older soils are believed to have been subject to prolonged deposition of airborne salts. In the northern part of the Jordan valley, four soils are common: (1) soils with high groundwater table with the highest concentration of salts and exchangeable sodium in the upper layers; (2) soils with a somewhat deeper water table where the high salinity and alkalinity are in deeper layers; (3) soils which had high groundwater tables in the past, but which have been leached to some extent; and (4) soils which did not have a high water table, but nevertheless are alkaline, also somewhat saline in the deeper layers. The aforementioned soils, except (1) have been subject to some leaching. In the southern part of the valley, most of the soils are highly saline, and the low rainfall precludes natural leaching. Major characteristics of the soils are related to high salinity and high levels of exchangeable sodium. (Bahre-Arizona)
W73-12795

THE EFFECT OF SOIL TEMPERATURE ON PLANTS GROWN IN SALINE SOIL,
Hebrew Univ., Rehovot (Israel). Dept. of Soil Science.
S. Ravikovitch, and J. Navrot.
Soil Science, Vol 113, No 6, p 431-439. 1972. 5 fig, 1 tab, 17 ref.

Descriptors: *Soil temperature, *Saline soils, *Plant growth, Soil tests, Temperature control, Nutrient requirements, Soil-water-plant relationships, Field crops, Phosphorus, Nitrogen, Soil treatment, Soil moisture.

Saline and nonsaline soils and phosphorus fertilization were used in a study of the influence of soil temperature on growth. Soil temperatures were maintained by placing pots in thermostatically controlled water baths at ambient temperatures, 15, 25, 35, and 43C. The experiment also included nutrient treatments in which nitrogren was kept constant for each crop with various levels of phosphorus being applied. Potassium was given at a constant rate in all treatments. The effect of soil temperature was most marked in plants grown in nitrogen-phosphorus-treated soils. Growth was especially stimulated by NP treatments with a high P level. Optimum soil temperature for plant growth was 25C for clover, 35C for corn. For millet it was 35C in saline soil and 43C in nonsaline soil. At all soil temperatures, the Cl content of plants growing in saline soils decreased with an increase in the P application. With increasing salinity, there was an increase in plant phosphorus content. (Bahre-Arizona)
W73-12797

EFFECT OF LEVEL OF SOIL MOISTURE ON NITROGEN MINERALIZATION AND NITRIFICATION DURING INCUBATION OF EAST PAKISTAN TEA SOILS,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 03F.

W73-12799

SIGNIFICANCE OF HEATING AGRICULTURAL SOILS,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 03F.
W73-12802

NOMOGRAPH FOR THE SATURATION PERCENTAGE OF SOIL,
A. Zanker.
Soil Sci. Vol 113, No 5, p 373-374. 1972. Illus.
Identifiers: Nomograph, *Saturation (Soils), *Soil water.

Among the methods for soil water saturation determination, the one proposed by Wilcox is the simplest, and gives very accurate results. A nomograph is presented, which allows calculation of the soil water percentage by the Wilcox method in a few seconds.--Copyright 1973, Biological Abstracts, Inc.
W73-12807

NOMOGRAPH FOR HYDRAULIC CONDUCTIVITY AND INTRINSIC PERMEABILITY OF WATER-SOIL SYSTEM,
A. Zanker.
Soil Sci. Vol 113, No 5, p 375-377. 1972. Illus.
Identifiers: *Hydraulic conductivity, Nomograph, *Permeability, *Soil-water system.

The hydraulic conductivity and intrinsic permeability of soil to water are functions of the length of soil column, volume of percolate in a given time, cross-sectional area of soil column, difference of hydraulic head and temperature of water. The calculation of those properties is rather troublesome and time-consuming. A nomograph is presented which allows calculation of both properties in a few seconds.--Copyright 1973, Biological Abstracts, Inc.
W73-12808

RAPID FIELD DETERMINATION OF NITRATE IN NATURAL WATERS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 02K.
W73-12810

MORPHOLOGY, GENESIS, OCCURRENCE AND AGRICULTURAL POTENTIAL OF ACID SULPHATE SOILS IN CENTRAL THAILAND,
Food and Agriculture Organization of the United Nations, Bangkok (Thailand). Soil Survey Land Classification Project.
W. Van Der Kevie.
Thai J Agric Sci. Vol 5, No 3, p 165-182, 1972, Illus.
Identifiers: *Acid soils, Agricultural, Genesis, Morphology, Soils, *Sulfate soils, *Thailand.

An area of 800,000 ha consists of acid sulfate soils. They are poorly drained, strongly acid, heavy clay soils, and subject to prolonged flooding during the rainy season. The classification of these soils is discussed. A brief outline of the formation of the marine and brackish water sediments and their approximate age, determined by C 14 dating methods, is given. Soil profile development of younger and older acid sulfate soils is described. The soil potential for agriculture is discussed and possible ways of improvement of these soils are indicated.--Copyright 1973, Biological Abstracts, Inc.
W73-12818

EFFECT OF SOIL MOISTURE ON THE GROWTH OF MACROPHOMINA PHASEOLI, SCLEROTIUM ROLFSII AND FAUSARIUM SOLANI IN SOIL,
Jute Agricultural Research Inst., Barrackpore (India).
For primary bibliographic entry see Field 03F.
W73-12831

FLOW OF MICROBIALLY FIXED NITROGEN IN A MODEL ECOSYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-12847

GERMINATION OF WHEAT AS AFFECTED BY SOIL WATER STRESS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 03F.
W73-12884

DETERMINATION OF AMMONIUM IN SOIL EXTRACTS AND WATER SAMPLES BY AN AMMONIA ELECTRODE,
Iowa State Univ., Ames. Dept. of Agronomy.
W. L. Banwart, M. A. Tabatabi, and J. M. Bremmer.
Commun Soil Sci Plant Anal. Vol 3, No 6, p 449-458. 1972. Illus.
Identifiers: *Ammonia electrode, *Ammonium determination, Samples, *Soil extracts.

Interference and recovery tests reported indicate that the Orion ammonia electrode can be used satisfactorily for determination of ammonium in soil extracts and water samples. The electrode method of analysis described is rapid, simple, and precise, and its results agree closely with those obtained by a distillation-titration method of determining ammonium in soil extracts and water samples.--Copyright 1973, Biological Abstracts, Inc.
W73-12939

NITROGEN LOSS FROM FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
W. H. Patrick, Jr., and M. E. Tusneem.
Ecology, Vol 53, No 4, p 735-737, 1972, Illus.
Identifiers: Diffusion, *Flooded soil, Nitrification, *Nitrogen, Soils, Anaerobic conditions.

An appreciable loss of labeled N occurred in flooded soils exposed to atmospheric O2. N added as ammonium was apparently nitrified in the aerobic surface layer of soil and then diffused downward into the underlying anaerobic zone where it was denitrified and lost from the system.--Copyright 1973, Biological Abstracts, Inc.
W73-12967

WATER VAPOR ADSORPTION BY WATER--REPELLENT SOILS AT EQUILIBRIUM,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
S. Miyamoto, J. Letey, and J. Osborn.
Soil Sci, Vol 114, No 3, p 180-184, 1972, Illus.
Identifiers: *Adsorption (Soils), Equilibrium, Repellents, Soils, Temperature, *Water vapor, Wettability, Surface tension.

Water vapor adsorption by soil and sand samples which have different surface tensions were examined at equilibrium under a controlled temperature of 30 plus or minus 0.5C. No specific trend or differences which could be uniquely related to repellency were found on the amount adsorbed/unit area, the shape of adsorption isotherm, the heat of adsorption and the integral free energy of adsorption. The differences in initial vapor adsorption levels under the controlled temperature did not influence the measurable value of the surface tension and consequently repellency of the samples used. Adamson's method to determine the equilibrium contact angle and the spreading coefficient by adsorption isotherm alone appeared not to apply for porous media. The apparent independence of water vapor adsorption upon the differences in surface tension of porous media implied that mechanisms of wettability and repellency of porous media may be occurring at the portion which is beyond the vapor adsorption or masked by other soil properties.--Copyright 1973, Biological Abstracts, Inc.
W73-12968

EDAPHIC AND WATER RELATIONSHIPS OF ALDICARB AND ITS METABOLITES,
North Dakota State Univ., Fargo. Dept. of Entomology.
M. S. Quraishi.
Can Entomol. Vol 104, No 8, p 1101-1196. 1972. Illus.
Identifiers: *Aldicarb, *Edaphic relationships, Light, Metabolites, Potatoes, Roots, Storage, Sun, Temperature, Sugarbeets.

Laboratory investigations were made to determine the persistence of aldicarb and its metabolites in soil (clay loam pH 6.8-7.2) and in water collected from fields. At dose rates of 15 and 20 ppm, aldicarb was not detectable in soil after 8 and 12 wk, respectively. At 50 ppm, after 11 wk chemically detectable amounts of the insecticide were present in the soil. Soil samples were stored between 23 and 28C but temperature at times reached 32C. In field water treated in the laboratory at 100 ppm of aldicarb, the chemical and its metabolites were detectable at 0.4 ppm 11 mo. later. Water was stored at 16-20C and was exposed for 507.5 hr to sunlight. Aldicarb was eluted readily with water from soil columns. When aldicarb was applied as side dressing at the time of planting of sugarbeet roots and potatoes, residues of less than 0.05 ppm were found in soil and potatoes at harvest. One sugarbeet root sample contained 0.2 ppm of the chemical and its metabolites.--Copyright 1973, Biological Abstracts, Inc.
W73-12979

2H. Lakes

THE SEDIMENTS AND HISTORY OF LAKE BUTTE DES MORTS, WISCONSIN,
Wisconsin State Univ., Oshkosh. Limnology Lab.
For primary bibliographic entry see Field 02J.
W73-12355

INVESTIGATIONS ON AMERICAN SHAD IN THE ST. JOHNS RIVER,
R. O. Williams, and G. E. Bruger.
Fla Dep Nat Resour Mar Res Lab Tech Ser. 66. p 1-49. 1972. Illus.
Identifiers: Alosa-Sapidissima, *American shad, Crustaceans, *Florida (St. Johns River), Growth, Insects, Rivers, Shad, *Spawning.

A study of American shad, Alosa sapidissima (Wilson), in the St. Johns River was conducted to determine the spawning grounds, movement, growth, and food habits of juveniles, and to evaluate effects of the fisheries and proposed environmental alterations on the populations. Spawning grounds were located by collecting free-drifting, demersal shad eggs in plankton nets set along the river bottom. Spawning began at Crows Bluff west of DeLand and extended south about 100 mi to USA Highway 192 west of Melbourne, but most spawning occurred between Lakes Monroe and Poinsett. Importance of the spawning area between Lakes Harney and Poinsett increased during low water when there was little current in the area north of Lake Harney. Eggs were generally collected over clean sand bottom of less than 4 m depth and in current of 1-1 1/2 ft/sec. Juvenile movement and growth were determined by monthly collections of young shad with beach seines, plankton nets, and trawls. Movement pat-

terns were related to current and water temperature with downstream movement from spawning grounds to nursery area occurring as water temperatures increased in spring, and emigration from the river occurring when temperatures dropped in late autumn. Growth was more rapid during the 1970 season. Juveniles collected emigrating from the river in 1969 ranged from 69-110 mm FL (fork length). Young shad fed primarily on crustaceans and insect larvae; crustaceans were the dominant food type. Commercial and sport fisheries have changed significantly from accounts given by previous investigators. Production of both fisheries has declined in recent years. Gill nets are the primary commercial gear; haul seines are nearly defunct. There is some evidence of overfishing, especially of female shad. Proposed upper river alterations such as the St. Johns-Indian River Canal and water control projects by the Central and Southern Florida Flood Control District are discussed and evidence is presented that they may reduce future shad runs by eliminating and/or degrading sections of spawning area between Lakes Monroe and Poinsett.--Copyright 1972, Biological Abstracts, Inc.
W73-12370

PREIMPOUNDMENT STUDY OF WEST POINT LAKE, GEORGIA,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05C.
W73-12376

NUTRIENT ENRICHMENT AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 05C.
W73-12377

GAS PRODUCTION IN SEDIMENTS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12378

THE INFLUENCE OF VEGETATION ON THE REDOX PROFILE IN THE SEDIMENT OF GRANE LANGSO, A DANISH LOBELIA LAKE,
Copenhagen Univ., Hillerod (Denmark). Freshwater-Biological Lab.
For primary bibliographic entry see Field 05C.
W73-12379

FINITE ELEMENT SHALLOW LAKE CIRCULATION ANALYSIS,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
R. H. Gallagher, J. A. Liggett, and S. T. K. Chan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9855, p 1083-1096, July 1973. 9 fig, 14 ref, append.
NSF Grant GK-23992.

Descriptors: *Water circulation, *Lakes, *Finite element analysis, *Lake Ontario, Equations, Mathematical models, Numerical analysis, Currents (Water), Flow.

A finite element formulation is given for the analysis of the wind-driven circulation of homogeneous variable-depth, shallow lakes. The method of weighted residuals is used to transform the governing differential equation to an integral form which in turn is approximated by linear stream function fields in triangular elements. Numerical results are presented for a rectangular basin and for lake Ontario. (Knapp-USGS)
W73-12413

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-12429

THE SHAGAWA LAKE PROJECT: LAKE RESTORATION BY NUTRIENT REMOVAL FROM WASTEWATER EFFLUENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W73-12520

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF LAKES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W73-12624

BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS-ANALYSIS AND BIBLIOGRAPHY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-12625

THE FOOD AND FEEDING HABITS OF THE SMALL MORMYRID FISHES OF LAKE VICTORIA, EAST AFRICA,
East African Freshwater Fisheries Research Organization, Jinja (Uganda).
J. Okedi.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 1-12. 1971. Illus.
Identifiers: Chironomid, *East Africa feeding habits (Fish), *Fish food, Gnathonemus-Longibarbis, Gnathonemus-Victoriae, Habits, Lakes, Marcusenius-Grahami, Marcusenius-Nigricans, Mormyrid, Petrocephalus-Catostoma, Povilla, *Lake Victoria.

The feeding habits of Gnathonemus longibarbia, G. victoriae, Marcusenius grahami, M. nigricans and Petrocephalus catostoma including the feeding requirements of both adults and immature fish in affluent rivers and swamp pools where spawning takes place were investigated. Seasonality of accumulation of abdominal fat reserves and intensified periods of feeding activity during sexual quiescence contrasted with lessened feeding activity during breeding periods in adult fishes. The quantity of Chironomid and Povilla larvae, which formed the chief food, in the stomachs of the Mormyrids, appeared to be correlated with certain lunar phases.--Copyright 1973, Biological Abstracts, Inc.
W73-12641

THE LAKE CHILWA TILAPIA AND ITS FISHERY,
Chancellor Coll., Limbe (Malawi).
P. R. Morgan.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 51-58. 1971. Illus.
Identifiers: Barbus-Paludinosus, Clarias-Mossambicus, *Fishery, Lakes, *Malawi, Tilapia, Tilapia-Shirana, *Lake Chilwa.

Lake Chilwa, a shallow tropical lake in southern Malawi, experiences considerable fluctuations in water level which seriously affect its fishery. Particular attention is drawn to the effects of water level upon the endemic Tilapia shirana chilwae. When the lake level falls drastically, Tilapia is usually the first important commercial fish to suffer, with mass mortalities being recorded on several occasions. Barbus paludinosus, another important species is similarly affected, but the catfish Clarias mossambicus is very resistant to periods of low water. The history of the Tilapia fishery passed through several phases. Between 1960 and 1965 fish exports rose, then declined between 1965 and 1968 when the lake became dry, followed by another rise after 1968 when the lake was reflooded. The instability of the lake and its fishery will probably persist. Schemes for maintaining a more consistent output of fish are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12642

THE SIZE AT MATURITY AND BREEDING SEASONS OF SARDINES IN SOUTHERN LAKE TANGANYIKA,
C. M. A. Ellis.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 59-66. 1971. Illus.
Identifiers: *Breeding, Lakes, Limnothrissa-Miodon, *Maturity, *Sardines, Seasons, Size, Stolothrissa-Tanganicae, *Lake Tanganyika.

Stolothrissa tanganicae and Limnothrissa miodon showed a marked seasonal shift in the size at which they first became mature, this being lowest during their main breeding seasons. Stolothrissa females were first mature at an annual mean of 75 mm fork length and the males at 70 mm. Limnothrissa females reached maturity at 75 mm and the males at 64 mm. Mature Stolothrissa were found throughout the year with a peak of activity in the dry season between April and July, and during the wet season in Dec.-Jan. Linnothrissa with active gonads were found in Dec.-May with a distinct breeding peak during March-May and Dec.-Jan. Two sampling localities approximately 60 km apart appeared to support different Stolothrissa populations.--Copyright 1973, Biological Abstracts, Inc.
W73-12649

LAKE MOVEMENTS WITH PARTIAL ICE COVER,
Ontario Water Resources Commission, Toronto.
M. D. Palmer, and J. B. Izatt.
Limnol Oceanogr. Vol 17, No 3, p 403-409. 1972. Illus.
Identifiers: *Canada, Currents, *Ice cover, Lakes, Temperature, *Lake Erie.

A recording current meter was operated under a winter ice sheet at Nanticoke, Lake Erie, in 11 m of water at a depth of 3 m from the bottom. Current magnitude and direction and water temperature were measured every 10 min. Current magnitudes up to 1 mo. after the ice sheet formed were similar to measurements made without ice; autovariance density spectra for this period showed energy concentrations at frequencies corresponding to the free oscillation modes of Lake Erie. Several months after the ice had been in place the measured currents were half as fast (3-9 cm/sec) and spectra during this period showed no energy concentrations at Lake Erie oscillation frequencies.--Copyright 1973, Biological Abstracts, Inc.
W73-12663

RADIATION REGIME OF LAKE CHELKAR AND ADJOINING REGIONS (O RADIATSIONNOM REZHIME OZERA CHELKAR I PRILEGAYUSHCHEY K NEMU TERRITORII),
L. S. Aleksandrova.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 1, p 56-61, January-February 1973. 5 fig, 8 tab, 5 ref.

Descriptors: *Lakes, *Radiation, Albedo, Cloud cover, Surfaces, Curves.
Identifiers: *USSR (Aktynbinsk Oblast), *Lake Chelkar.

Radiation regime of Lake Chelkar in the Aktyubinsk Oblast was investigated in actinometric observations performed by the USSR Academy of Science's Laboratory of Limnology in July-August 1965. Daily total radiation values for the lake varied between 359 and 700 cal/sq cm in July and between 254 and 625 cal/sq cm in August. Daily total radiation values for land areas varied between 354 and 703 cal/sq cm in July and between 266 and 638 cal/sq cm in August. Radiation absorbed at the lake's surface was 17.5 kcal/sq cm in July and 15.0 kcal/sq cm in August, while the radiation absorbed at the earth's surface during these periods was 14.3 kcal/sq cm and 12.4 kcal/sq cm, respectively. The portion of radiation absorbed by the lake was 96% and that absorbed by the earth's surface was 70%. Differences in albedo values for lake and earth surfaces are appreciable, amounting to 14%-15%. (Josefson-USGS)
W73-12724

INVESTIGATION OF LAKE-LEVEL FLUCTUATION PATTERNS AND MOISTURE CONDITIONS IN THE MIDDLE AND SOUTHERN URALS (ISSLEDOVANIYE ZAKONOMERNOSTEY KOLEBANIY UROVNYA OZER I UVLAZHNENNOSTI SREDNEGO I YUZHNOGO URALA),
M. A. Andreyeva.
Vsesoyuznoye Geograficheskoye Obshchestvo Izvestiya, Vol 105, No 1, p 51-56, January-February 1973. 4 fig, 4 ref.

Descriptors: *Lakes, Water levels, Water level fluctuations, *Moisture, *Mountains, Air circulation, Cycles, Correlation analysis, Regression analysis, Curves, Equations.
Identifiers: USSR, *Urals.

Clearly expressed 20-25 year cycles are observed in lake-level fluctuations in the Urals. The rising stage lasts 6-7 years, the period of unsteady maximum, 3-4 years, and the declining stage, 10-12 years. Long-term lake-level fluctuations correlate closely with meteorological conditions and especially with total moisture. Average duration of low stages is 12-13 years in the Transurals and 10-12 years in the Cisurals. High stages are of shorter duration, lasting an average of 7-9 years. Coefficients of low stages vary between 0.6 and 0.9 and decrease toward the south and southeast. Coefficients of high stages vary between 1.2 and 2.0, reaching maximum values in the forest-steppe zone of the Transurals. (Josefson-USGS)
W73-12725

MEASUREMENT OF CURRENTS IN THE GREAT LAKES,
Ministry of the Environment, Ottawa (Ontario).
M. D. Palmer.
International Field Year for the Great Lakes Technical Manual Series No 3; Canadian National Committee for the International Hydrological Decade, Ottawa, Canada, 1972. 32 p, 12 fig, 7 plate, 41 ref, 2 append.

Descriptors: *Great Lakes, *Current meters, *Instrumentation, Water measurement, Data collections, Tracers, Water circulation, Limnology, Currents (Water), Telemetry, Remote sensing, Aerial photography.

This manual is directed toward some of the problems encountered in Great Lakes current measurements. Currents can be measured by either placing a current meter at a fixed point, or by tracking the movement of a free object as it is carried by the water. The fixed meter, or Eulerian technique, is particularly useful for the study of the dynamics of water movement. The free-drifter, or Lagrangian technique, is most useful for the study of diffusion and mass transport. To calculate the mean mass flux past a given Eulerian observing station it is necessary to add an additional term, the Stokes Velocity, which depends on the time and distance scales of the fluctuating currents, and may not apply to the shallow nearshore waters. The relation between the mean velocities observed by the two techniques is 3 lagrange ± Euler and Stokes. In general, meters can be classified as to whether or not they record internally, and by the type of current sensor (transducer) used in the device. Lagrangian measurements are historically the oldest type of measurements. In general they consist of tracing the movement of some identifiable marker that is transported by currents. These direct measurements of particle movement are important for determining the characteristics of dispersion or movement of material discharged into a lake. (Knapp-USGS)
W73-12741

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL I - CHEMISTRY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
D. Proto, and R. A. Sweeney.
Copy available from G.PO Sup Doc as EP1.23:73-0282, $1.25; microfiche from NTIS as PB-222 302, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-028a, March 1973. 102 p, 1 fig. EPA 16120 HVR.

Descriptors: *Lake Ontario, Great Lakes, Limnology, *Instrumentation, *Chemical properties, *Bibliographies, Abstracts.

One hundred eighty-seven (187) papers concerning chemical aspects of Lake Ontario and influent tributaries were reviewed and abstracted. Each paper was cross-indexed by author, geographic area of lake and/or tributary in which study was performed, technique and instrumentation and parameters. In addition, a list of addresses for the authors and agencies was included along with other possibly pertinent references which the authors were not able to secure and review within the time limitations of the grant. (See also W73-12754 and W73-12755) (EPA abstract)
W73-12753

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL II - BIOLOGY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
E. P. Downing, J. E. Hassan, and R. A. Sweeney.
Copy available from GPO Sup Doc as EP1.23:73-028b, $2.60; microfiche from NTIS as PB-222 303, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-028b, March 1973. 236 p, 1 fig. 16120 HVR.

Descriptors: *Lake Ontario, Great Lakes, Limnology, *Biological properties, *Instrumentation, *Bibliographies, Abstracts.

Five hundred ninty-six (596) papers concerning biological aspects of Lake Ontario and influent tributaries were reviewed and abstracted. Each paper was cross-indexed by author, geographic area of lake and/or tributary in which study was performed, organism, habitat niche and techniques and instrumentation. In addition, a list of addresses for the authors and agencies is included along with other possibly pertinent references which the authors were not able to secure and review within the time limitations of the grant. (See also W73-12753 and W73-12755) (EPA abstract)
W73-12754

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL III - PHYSICAL,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
J. Baldwin, and R. A. Sweeney.
Copy available from GPO Sup Doc as EP1.23:73-028c, $2.60; microfiche from NTIS as PB-222 304, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-028c, March 1973. 207 p, 1 fig. EPA 16120 HVR.

Descriptors: *Lake Ontario, Great Lakes, Limnology, *Instrumentation, *Bibliographies, *Physical properties, Abstracts.

Four hundred thirty-nine (439) papers concerning physical aspects of Lake Ontario and influent tributaries were reviewed and abstracted. Each paper was cross-indexed by author, geographic area of lake and/or tributary in which study was performed, parameters, techniques and instrumentation. In addition, a list of addresses for the authors and agencies was included along with other possibly pertinent references which the authors were not able to secure and review within the time limitations of the grant. (See also W73-12753 and W73-12754) (EPA abstract)
W73-12755

NITRIFICATION IN SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Sciences.
For primary bibliographic entry see Field 05C.
W73-12763

EXPLORATORY BOTTOM TRAWLING IN LAKE VICTORIA,
Food and Agriculture Organization of the United Nations, Jinja (Uganda). Lake Victoria Fisheries Research Project.
E. Bergstrand, and A. J. Cordone.
Afr J Trop Hydro-Biol Fish. Vol 1, No 1, p 13-23. 1971. Illus.
Identifiers: Bagrus-Docmac, Bottom trawling, Clarias-Mossambicus, *Haplochromis, Lakes, Protopterus-Aethiopicus, Tilapia-Esculenta, *Trawling, *Lake Victoria.

The first lakewide exploratory bottom-trawl survey of Lake Victoria was initiated in Sept. 1968 and terminated in May 1970. Gear experimentation was completed in 1968 and fullscale fishing started in Jan. 1969. Excluding the experimental phase; 841 drags were made which yielded 272,980 kg of fish. Total trawling time was 1117 hr and the distance covered by the trawl approximated 6209 km. The overall hourly catch rate was about 244 kg. Codends of various mesh sizes were employed but the 2 sizes used most often measured 6.4 and 3.8 cm (stretch measure). Catch rates were inversely correlated with mesh size. The catch was dominated by Haplochromis species which constituted 54.3% by weight of the total. Bagrus docmac contributed 11.7% and Clarias mossambicus 10.4%. Other important species weightwise were Protopterus aethipicus and Tilapia esculenta. Species hourly catch rates and percentage frequency of occurrence are presented for each of the 8-10-m depth intervals.–Copyright 1973, Biological Abstracts, Inc.
W73-12803

BENTHIC INVERTEBRATES IN LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-12863

CHEMISTRY AND TROPHIC STATUS OF SEVEN NEW ZEALAND LAKES,
Department of Scientific and Industrial Research, Taita (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 05C.
W73-12928

AGE, GROWTH REPRODUCTION, AND FOOD OF THE BURBOT, LOTA LOTA (LINNAEUS), IN SOUTHWESTERN LAKE SUPERIOR,
Fish and Wildlife Service, Ashland, Wis.
M. M. Bailey.

Trans Am Fish Soc. Vol 101, No 4, p 667-674. 1972. Illus.
Identifiers: Age, *Burbot, Food, Growth, *Lake Superior, Lota-lota, Mysis, Pontoporeia, Reproduction.

This study was based on 1285 L. lota collected in 3 areas in southwestern Lake Superior in 1966-69. Age was determined from otoliths, the marginal zones of which were opaque from Dec. to May and translucent from June to Nov. Average lengths of the age groups and annual increments were measured from a curve fitted by inspection to point estimates of lengths at capture. Burbot grew 5.7 in during the first yr of life and 4.3 in during the second. Later annual increments through the 12th yr ranged from 1.2 to 2.6 in. Average total lengths and calculated weights were 16.1 in and 1.1 lb at age V and 23.4 in and 3.2 lb at age X. First maturity was at age I, at a total length of 9.7 in for males and 10.7 in for females; all fish were mature at age V and at lengths greater than 16.4 in (males) and 15.9 in (females). Most burbot collected near shore in the Apostle Islands area in late Jan. and Feb. were spent, but none collected in offshore areas during Jan. and March had spawned. The estimated number of eggs in the ovaries of 8 burbot 14.7-21.3 in long ranged from about 268,800 to 1,154,000 and averaged about 812,300. Burbot of all sizes fed on fish and crustacenas. Fish heavily predominated in the food of large burbot taken during the winter (99.6% of the volume) but crustaceans (Mysis and Pontoporeia) became increasingly important during the summer and fall (when they contributed more than 73% of the volume). Due to the wide variety and large volume of food consumed, the burbot is probably a significant competitor of many other species.--Copyright 1973, Biological Abstracts, Inc.
W73-12934

MULTIPLE-USE PROBLEMS IN THE GREAT LAKES.
For primary bibliographic entry see Field 06B.
W73-12960

TOWARD A REGIONAL POLICY FOR THE GREAT LAKES,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 06B.
W73-12963

THE PLANNING VIEWPOINT,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06B.
W73-12964

THE SEASONAL ABUNDANCE OF THE ANCYROCEPHALINAE (MONOGENEA) ON LARGEMOUTH BASS IN WALTER F. GEORGE RESERVOIR,
Georgia Univ., Athens. School of Forest Resources.
M. V. Rawson, and Wilmer A. Rogers.
Proc Helminthol Soc Wash. Vol 39, No 2, p 159-162. 1972. Illus.
Identifiers: Abundance, Actinocleidus-Fusiformis, Ancyrocephalinae, Bass, Clavunculus-Bursatus, *Largemouth bass, *Monogenea, Reservoirs, Seasonal, Temperature, Urocleidus-Furcatus, Urocleidus-Principalis.

Four species of Ancyrocephalinae were collected from largemouth bass in Walter F. George Reservoir from Dec. 1967 to Jan. 1969. The abundance of Urocleidus principalis and U. furcatus peaked at 28 C in June and mid-Sept., declined in the early fall, and then rose to another peak in Dec. at 9 C. The abundance of Actinocleidus fusiformis peaked prior to the spring period of maximum temperature change in June and mid-Sept. at 28 C and in Dec. at 9 C. Abundance of Clavunculus bursatus peaked in the early spring and late fall at 9 C. The peaks of abundance seemed to be a water temperature-associated phenomenon.--Copyright 1973, Biological Abstracts, Inc.
W73-12978

2I. Water in Plants

RESISTANCE IN DIGITARIA TO YELLOW SUGARCANE APHID, SIPHAFLAVA (FORBES) AS RELATED TO TEMPERATURE AND RAINFALL,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
A. J. Oakes, and A. Sierra-Bracero.
J Agric Univ P R. Vol 56, No 1, p 33-38. 1972.
Identifiers: *Aphids (Yellow sugarcane), *Digitaria, *Rainfall, Sipha-Flava, *Temperature, Differential resistance, Insects.

Differential resistance to yellow sugarcane aphid, Siph flava, exists among Digitaria species. Differential resistance among species is expected on the basis of interspecific variation. Differential resistance to aphid damage exists among clones within species. Differences in insect resistance among clones within species are expected on the basis of intraspecific variation. Clones superior to insect resistance were delineated in this trial. The superior performance of phenotypes within species is masked by the average performance of the species. Significant negative correlations were found between insect resistance ratings and the number of rainy days and average temperature during a 28 day interval prior to rating. A model was calculated for the average behavior of species; it included infestation expected on the basis of the number of rainy days and average temperature during the 28-day interval before rating. The model accounted for approximately 66% of the variability present.--Copyright 1973, Biological Abstracts, Inc.
W73-12643

GREEN SNOW AND ICE FROM THE ANTARCTICA,
National Museum of Natural History, Budapest (Hungary).
E. Kol.
Ann Hist Natl Hung. 63: p 51-56. 1971. Illus.
Identifiers: *Algae, *Antarctica, Bracteococcus-Minor-Var-Glacialis, Chlamydomonas-Ballenyana-Var-Minor, Ice, Seston, *Snow.

Six green algal species, deriving from green snow and ice samples collected by Professor P. M. Arnaud on Terre Adelie, Antarctica, are discussed; the predominating taxa are Bracteococcus minor var. glacialis Flint, and Chlamydomonas ballenyana var. minor var. nova. An alga diagram shows also the quantitive occurrence of the microorganisms of the cryoseston. A review and comparison of the green cryosestons published from the Antarctica are also given.--Copyright 1973, Biological Abstracts, Inc.
W73-12644

WATER PATHWAYS IN HIGHER PLANTS: II. WATER PATHWAYS IN ROOTS,
Southampton Univ. (England). Dept. of Botany.
T. W. Tanton, and S. H. Crowdy.
J Exp Bot. Vol 23, No 76, p 600-618. 1972. Illus.
Identifiers: *Carrots, Plants, *Roots, *Wheat.

The technique for studying the pathways of water movement was applied to the transpiration stream in the roots of higher plants. Free space was confined to the cell walls except in flooded tissue where intercellular spaces were also included. Errors involved in free-space estimates were discussed and free-space volumes of 5.4% were obtained for wheat root cortex and 4.1% for carrot xylem parenchyma. The main water-absorbing regions of roots begin immediately behind the elongating zone, where the first xylem elements are fully differentiated, and end when the endodermis undergoes secondary wall development. In the cortex the transpiration stream is located mainly in the cell wall. Calculations indicate that the symplastic pathway is of only minor importance in transpiring plants. At the endodermis the free-space pathway is blocked by the Casparian strip and all water and solute entering the stele must pass through the lumen of the endodermal cells. The permeability of individual endodermal cells varies considerably both between cells of the same species and between those of different species. Once inside the endodermis, the transpiration stream returns to the cell-wall pathway until it reaches the xylem vessels where it enters the lumen of the mature xylem elements. (See also W73-12652)--Copyright 1973, Biological Abstracts, Inc.
W73-12651

WATER PATHWAYS IN HIGHER PLANTS: III. THE TRANSPIRATION STREAM WITHIN LEAVES,
Southampton Univ. (England). Dept. of Botany.
T. W. Tanton, and S. H. Crowdy.
J Exp Bot. Vol 23, No 76, p 619-625. 1972. Illus.
Identifiers: Bean, *Chelates, Laurel, Lead, *Leaves, Plantain, Plants, Stream, *Transpiration, Wheat.

Water in the transpiration stream is distributed throughout the leaves in the vascular bundles. In wheat, water appears to be confined to the main veins by the mestome sheath and to enter the mesophyll through the walls of the smaller veins. Within the mesophyll the water in the transpiration stream moves in the free space of the cell walls to the evaporating surfaces of the leaf. The lead chelate, which is used to trace the transpiration stream, accumulates at the final points of evaporation at the margin of the leaf. Lead chelate accumulates beneath and on the surface of the cuticle, being partly associated with the anticlinal walls of the epidermal cells, the walls of the stomatal guard cells and specialized epidermal cells. Chelate does not accumulate at the base of substomatal cavities, indicating that the cuticle of the epidermis is the main evaporating surface of the leaf. The behavior in broad bean, laurel, and plantain is essentially the same. The rate of peristomatal and cuticular transpiration is closely related to the size of the stomatal aperture. Conditions which control stomatal aperture also cause changes in the dimensions of the epidermal cells. (See also W73-12651)--Copyright 1973, Biological Abstracts, Inc.
W73-12652

BOTANY ALONG SONAMARG TO TRUNKHAL,
Sri Pratap Coll., Srinagar (India). Dept. of Botany.
K. A. Malik, and G. Singh.
Kashmir Sci. Vol 7, No 1/2, p 82-88. 1970. Illus.
Identifiers: *Botany, Climates, *India, Kashmir, Soils, Sonamarg, Species, Trunkhal, Vegetation.

The botanical tour undertaken in June, 1969 in N. E. Kashmir from Sonamarg to Trunkhal is described. The tract covered is 96 km long, wholly mountainous and surrounded by mountain ranges of considerable heights with snow-covered peaks. A complete physical description of this site is given as to snow cover, rainfall, soil types, and the location of alpine meadows and bodies of water. The distribution of vegetation is given as well as an enumeration of the plant species found.--Copyright 1973, Biological Abstracts, Inc.
W73-12657

WATERFOWL UTILIZATION OF BEAVER PONDS IN NEW BRUNSWICK,
New Brunswick Univ., Fredericton. Northeastern Wildlife Station.
R. N. Renouf.

J Wildl Manage. Vol 36, No 3, p 740-744. 1972. Illus.
Identifiers: Anas-Carolinensis, Anas-Platyrhynchos, Anas-Rubripes, Aytha-Collaris, Bucephala-Clangula, *Canada (New Brunswick), Castor-Canadensis, Lophodytes-Cucullatus, Ponds, *Waterfowl.

Waterfowl utilization of 41 beaver ponds in south-central New Brunswick was studied during 1969. Ponds occupied by beaver (Castor canadensis), temporarily or during the entire field season, were defined as active. There were 15 active and 26 inactive ponds. Black ducks (Anas rubripes) comprised 27 of the 47 broods observed. In addition, green-winged teal (A. carolinensis), hooded merganser (Lophodytes cucullatus) ring-necked duck (Aythya collaris), common goldeneye (Bucephala clangula), and mallard (Anas platyrhunchos) broods were seen. Thirty-eight broods were sighted on active ponds and only 9 on inactive ponds. Active ponds contained 0.75 brood/acre and inactive ponds 0.11 brood/acre. The seasonal drop of the water level was less in active ponds than in inactive ponds. Hence, brood cover was more abundant in active ponds, and the active ponds were better brood-rearing areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12662

WATER TEMPERATURE AND THE MIGRATIONS OF AMERICAN SHAD,
McGill Univ., Montreal (Quebec). Dept. of Biology.
W. C. Leggett, and R. R. Whitney.
U S Natl Mar Fish Ser Fish Bull. Vol 70, No 3, p 659-670. 1972.
Identifiers: Alosa-Sapidissima, *Shad (American), *Water temperature, *Fish migration.

The peak of spawning runs of American shad (Alosa sapidissima) into rivers at various latitudes on the Atlantic and Pacific coasts of North America takes place when water temperatures are near 18.5C. At the Bonneville Dam, Columbia River, Washington, 90% of the run as a rule takes place when river temperatures are between 16.0 and 19.5C. At the fish ladder of the Holyoke Water Power Company on the Connecticut River, the temperature at the peak of the shad run averaged 19.5C for 15 yr. In the St. Johns River, Florida, peak movement occurs in Dec. and Jan. at the time of the annual minimum water temperature, or 14 to 20C. Migrations of shad in the Atlantic Ocean follow paths associated with approximately the same range of temperatures (13-18C). Annual cycles of ocean warming cause shad to move into the Gulf of Maine in the summer, to the middle Atlantic in the winter, and to the south in the early spring. Juvenile shad move downstream in the fall, coinciding with a decline in the temperature of each stream to below 15.5C. A path of migration for shad in the Pacific Ocean is hypothesized from the known seasonal changes in ocean temperature. The potential effects of artificial warming of streams on timing and survival of shad runs in northern and southern latitudes are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12666

THE BENTHIC FAUNA IN FOUR SMALL SOUTHERN APPALACHIAN STREAMS,
Georgia Univ., Athens. Dept. of Entomology.
W. R. Woodall, Jr., and J. B. Wallace.
Am Midland Nat, Vol 88, No 2, p 393-407, 1972.
Identifiers: *Appalachia, *Benthic fauna, Biomass, Fauna, Pine, Streams, Vegetation, Watersheds (Basins), *Forest watersheds, Detritus.

Monthly quantitative samples of benthic organisms were collected from streams in 4 different watersheds from Aug. 1968 through July 1969. Each of the watersheds supports one of the following types of vegetation: old-field succession, hardwood forest, white pine forest with a few hardwoods, coppice forest. The kinds of organisms in the 4 streams were generally similar but their relative importance varied significantly. A Duncan's multiple-range test showed significant differences in the numbers of most taxa among the watersheds. The old-field stream had the greatest abundance while the coppice stream had the greatest standing crop biomass. The white pine stream had lowest standing crops of both numbers and biomass. Most of the differences among watersheds were attributed to different inputs of allochthonous detritus.--Copyright 1973, Biological Abstracts, Inc.
W73-12784

EXTREME WATER STRESS AND PHOTOSYNTHETIC ACTIVITY OF THE DESERT PLANT ARTEMISIA HERBA-ALBA ASSO,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
L. Kappen, O. L. Lange, E-D. Schulze, M. Evenari, and U. Buschbom.
Oecologia (Berlin), Vol 10, No 2, p 177-182, 1972. 2 fig, 20 ref.

Descriptors: *Sagebrush, *Soil-water-plant relationships, *Moisture stress, *Hydrostatic pressure, Deserts, Osmotic pressure, Diurnal, Dry seasons, Desert plants, Plant physiology, Leaves, Plant growth, Arid climates, *Photosynthesis, Water requirements, Summer, Metabolixm.
Identifiers: *Israel (Negev Desert), Artemisia herba-alba.

Artemisia herba-alba, a good example of a desert plant growing under high water stress, in the dry season in the Negev Desert, Israel, has a very low water content and shows values of negative hydrostatic pressure in the xylem down to -163 bars and an extreme of osmotic potential in the leaves of -92 bars. During the night the diurnal water stress is not greatly decreased. This study of native plants growing in their natural habitat shows that an extremely low water potential is not a transient phenomenon but a necessity for summer-active desert plants in order to keep up their water supply and metabolic activity during the whole dry season. Thus, a high stress resistance does not imply physiological inactivity, and under these conditions Artemisia is still photosynthetically active for a few hours of the day during the whole dry period. (Gloyd-Arizona)
W73-12785

DELAYED SEED DISPERSAL AND RAPID GERMINATION AS SURVIVAL MECHANISMS OF THE DESERT PLANT BLEPHARIS PERSICA (BURM.) KUNTZE,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
Y. Gutterman.
Oecologia, (Berlin), Vol 10, No 2, p 145-149, 1972. 1 tab, 1 fig, 7 ref.

Descriptors: *Seeds, *Dispersion, *Germination, *Soil moisture, Root development, Desert plants, *Rainfall, Adaptation, Environmental effects, Deserts, Plant growth, Diurnal, Temperature, Geotropism, Laboratory tests, On-site data collections.
Identifiers: Seed dispersal, 'Water clocks', 'Rain clocks', Israel.

Previous studies describe the intricate dispersal mechanism for seeds of the desert plant, Blepharis persica, so that no seeds are dispersed before the soil is wet enough to support the seedlings. Habitat conditions as a part of the survival mechanism are discussed. Laboratory experiments with seeds of six ecotypes of this desert species showed that these seeds are capable of germinating within 50 minutes of exposure to moisture, in light or dark, at temperatures ranging from less than 10C to over 40C. Within the first 24 hours from wetting, moreover, radicles reach a length of about 49 mm. Under natural conditions in sunlight seeds of the six ecotypes sown on the surface of wet sand were examined 50 minutes from the first wetting, and these showed radicles emerging from all seeds and starting to bend geotropically. The rapid germination capability in light and dark over a wide temperature range, together with the two 'water clocks' described earlier, assures that the seeds of this plant are not dispersed and do not germinate until a water supply ample for survival of the seedlings is present. Thus, the germination mechanism of Blepharis is demonstrated to be well adapted to desert conditions and an integral part of the survival mechanism for the species. (Gloyd-Arizona)
W73-12787

CENCHRUS CILIARIS--A PERENNIAL PASTURE GRASS OF ARID AND SEMI-ARID AREAS,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 04A.
W73-12790

THE INTERRELATIONSHIPS OF THE VEGETATION CHARACTERS OF FOUR SALT DESERT SHRUB ASSOCIATIONS OF COLORADO PLATEAU,
Pakistan Forest Inst., Peshawar.
For primary bibliographic entry see Field 03B.
W73-12791

SODIUM RELATIONS IN DESERT PLANTS: 1. CATION CONTENTS OF SOME PLANT SPECIES FROM THE MOJAVE AND GREAT BASIN DESERTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, E. M. Romney, and V. Q. Hale.
Soil Science, Vol 115, No 4, p 284-287, April 1973. 5 tab, 12 ref.

Descriptors: *Salt tolerance, *Sodium, *Cations, *Plant physiology, *Halophytes, Desert plants, Southwest U.S., Deserts, North America, Saline soils, Habitats, Calcium, Analytical techniques, Salts, Leaves, Soil horizons, Potassium, Soil chemical properties.
Identifiers: Mojave Desert, Great Basin Desert.

The deserts of western North America, and elsewhere, have many plant species that are highly adapted to salinity, and the present study was made in order to obtain a better understanding of salt tolerance in plants. Accordingly, the cation composition of some plant species, native to the northern Mojave and southern Great Basin Deserts and distributed in saline and nonsaline habitats, was examined. Leaves of 23 plant species was analyzed for mineral cations by an emission spectrographic technique. Some species tended to accumulate sodium in the leaves, particularly species that grew in areas where salts had accumulated. Distribution in the field of three Lycium species may be related to salinity. Sodium contents of the Lycium species were inversely related to those of calcium. In areas where other species accumulated sodium, Grayia spinosa was found to be an accumulator of large amounts of potassium. Several members of the Chenopodiaceae accumulated sodium in the leaves but not all of them did. Plant species and soil both seemed to determine the cation contents of plants. Larrea divaricata failed to grow where C horizons were highly saline and where A horizons contained over 10 me/100 g exchangeable potassium. Soil analyses were made for several locations by standard procedures. (See also W73-12793) (Gloyd-Arizona)
W73-12792

SODIUM RELATIONS IN DESERT PLANTS: 2. DISTRIBUTION OF CATIONS IN PLANT PARTS OF THREE DIFFERENT SPECIES OF ATRIPLEX,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, R. T. Mueller, and E. M. Romney.
Soil Science, Vol 115, No 5, p 390-394, May 1973. 4 tab, 21 ref.

Descriptors: *Salt tolerance, *Sodium, *Cations, *Plant physiology, Desert plants, Southwest U.S., Halophytes, Chlorine, Potassium, Leaves, Root zone, Sodium chloride, Nutrients.
Identifiers: *Saltbush.

Since various mechanisms seem to be involved in desert plants extremely tolerant of high concentrations of salts, sodium distribution in three species of Atriplex of southwestern U.S. was studied. A. hymenelytra cuttings were grown in Yolo loam soil for 35 days after addition of three levels of sodium chloride. Highest concentrations of sodium, chlorine, and potassium occurred in shoots with a steep gradient from top leaves to roots. High concentrations of sodium in leaves indicate the possible presence of salt glands. Yields of A. hymenelytra grown in solution culture responded some to sodium; root to leaf gradients for sodium and potassium were similar to the plants grown in soil. When other nutrients were not limiting, growth of A. confertifolia in the presence of a relatively sharp gradient of sodium content existed with leaves higher than stems and stems higher than roots. Yields were also increased by sodium for A. canescens, but sodium and potassium contents were much lower than for A. confertifolia, and the leaf-stem-root gradient for sodium was poorly pronounced. A. canescens seemed to be resistant to absorption of large quantities of sodium even though it tolerates high levels of it. (See also W73-12792) (Gloyd-Arizona)
W73-12793

WELWITSCHIA MIRABILIS: PARADOX OF THE NAMIB DESERT,
C. H. Bornman.
Endeavour, Vol 31, No 113, p 95-99, May 1972. 8 fig, 5 ref.

Descriptors: *Leaves, *Desert plants, *Moisture uptake, *Plant tissues, Gymnosperms, Africa, Fog, Plant morphology, Water utilization, Stomata, Absorption, Solutes, Translocation, *Adaptation, Arid climates, Deserts, Plant growth, Plant physiology, Root systems, Hydrostatic pressure, Evolution.
Identifiers: *Namib Desert (South West Africa), Coastal deserts, *Welwitschia.

Welwitschia mirabilis, first described in 1861, is a long-lived perennial, endemic to the Namib Desert of South West Africa. It is a monotypic species, grouped with the genera Ephedra and Gnetum in the Order Gnetales, Class Gymnospermae. Nonxeromorphic in aspect, the plant consists of a woody, unbranched, turnip-shaped stem having a depression surrounded by a rim of green, meristematic tissue from which two giant, parallel-ribbed leaves arise. The leaves, very long-lived and persistent, may reach enormous proportions and seem remarkably adapted to the prevailing desert conditions and coastal fog. It is on these huge exposed leaf surfaces that the early-morning fog condenses, is absorbed through the stomata, and conducted to various parts of the plant. The root system is relatively shallow and simple. Anatomical investigations by the author and others indicate that the ultrastructure of the food-conducting tissue of Welwitschia provides significant evidence against the theory of mass-flow of dissolved organic substances by hydrostatic pressure -- research that well may affect quite profoundly current concepts of food transport in plant tissues. This plant probably orginiated under tropical conditions, evolving and adapting in its development to the changing climatic conditions, now manifest by those of the Namib with its coastal fog. (Gloyd-Arizona)
W73-12796

MUSSELS IN THE UNIQUE NICKAJACK DAM CONSTRUCTION SITE, TENNESSEE RIVER, 1965,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research and Development.
B. G. Isom.
Malacol Rev. Vol 5, No 1, p 4-6. 1972. Illus.
Identifiers: *Construction sites (Dams), Corbicula-Manilensis, Dams, *Mussels, Nickajack Dam, Rivers, *Tennessee River, Clams.

Nickajack Dam is located at Tennessee River Mile (TRM) 424.7 in Marion County, Tennessee, just northwest of the juncture of the state lines of Alabama, Georgia and Tennessee. Mussels were collected 16 June 1965, the day the coffer dam was dewatered and the riverbed exposed for construction of the dam. Seventeen species of mussels and the Asiatic clam (Corbicula manilensis) were collected from the site. Seventy-six percent (13 of 17) of the mussel species collected were those reported by Ortmann (1925).--Copyright 1973, Biological Abstracts, Inc.
W73-12800

THE ANNUAL CYCLE OF SMALL MAMMAL POPULATIONS ON A ZAMBIAN FLOODPLAIN,
Akron Univ., Ohio. Dept. of Biology.
W. Sheppe.
J Mammal. Vol 53, No 3, p 445-460. 1972, Illus.
Identifiers: *Annual cycle, Crocidura-mariquensis, Crocidura-occidentalis, Floodplains, *Mammals, Mastomys-natalensis, Pelomys-fallax, *Zambian floodplain, Animal populations.

Several species of rodents and shrews live on the Kafue River Flats when they are not covered by floodwaters. Mastomys natalensis is usually the most abundant. Pelomys fallax, Crocidura mariquensis, and C. occidentalis often are common in wet sites. Breeding begins late in the dry season and is at its height during the rains. Populations are built up at this time, and as floodwaters rise over a period of several months they are forced to the margins of the floodplain, where they sometimes form dense refugee populations. As the flood slowly recedes they follow it out, and by the end of the dry season the few surviving animals are confined largely to marshy areas near the river. Body weight and fat deposits decrease during the dry season. Live-trapping studies suggest that populations are unstable throughout the year, with few animals resident in an area for more than a few weeks. Small mammals adapt to the unstable environment of the Flats by moving about more than populations in more stable environments and by breeding rapidly when conditions permit.--Copyright 1973, Biolgical Abstracts, Inc.
W73-12814

FROST RESISTANCE IN EUCALYPTUS: A NEW METHOD FOR ASSESSMENT OF FROST INJURY IN ALTITUDINAL PROVENANCES OF E. VIMINALIS,
Australian National Univ., Canberra. School of General Studies.
D. M. Paton.
Aust J Bot. Vol 20, No 2, p 127-139. 1972, Illus.
Identifiers: Altitudinal cline, Assessment, *Eucalyptus, Eucalyptus-viminalis, *Frost injury (Plants), Methods, Plant growth, *Australia.

Seedlings of E. viminalis were grown under controlled environmental conditions and exposed to single frost treatments between -1 and -5C. A new objective method for assessment of frost injury was developed on the basis that killed leaf tissue lost water until equilibrium was established with atmospheric moisture. The percentage ratio of dry weight to wet weight was found to increase from 30% for unaffected plants to 85% for killed plants, and intermediate values provided a reliable quantitative assessment of the severity of intermediate injury. There was no clear relationship between frost resistance and growth rate. Frost resistance increased with increase in altitude of seed source about 1000 ft, but the sea level provenance was as frost-resistant as the provenance at 3600 ft, which suggested that more than an altitudinal cline for frost resistance is involved. Variation in frost resistance within half-sib families and within provenances was often significant and of the same order as the variation between provenances. Thus frost resistance in E. viminalis appears to involve several different mechanisms. Within-provenance and within-family variability was characterized by a low frequency of plants with intermediate injury, and the implications of balancing selection between susceptible and resistant phenotypes as one possible mechanism for this, are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12815

FISHES OF THE YELLOW MEDICINE RIVER IN SOUTHWESTERN MINNESOTA,
Southwest Minnesota State Coll., Marshall. Dept. of Biology.
C. H. Ernst.
J Minn Acad Sci. Vol 38, No 1, p 14-16, 1972, Illus.
Identifiers: *Fishes, Impoundments, *Minnesota, Rivers, *Yellow Medicine River (Minn).

In view of the possible impoundment of the Yellow Medicine River in southwestern Minnesota, by a proposed Army Corps of Engineers dam, a survey of the fish-fauna of this river was undertaken. The fish-fauna is listed and discussed, as are the possible effects of the impoundment.--Copyright 1973, Biological Abstracts, Inc.
W73-12821

THE PROFUNDAL FAUNA OF LLYN TEGID, NORTH WALES,
Liverpool Univ. (England). Dept. of Zoology.
P. C. Hunt, and J. W. Jones.
J Zool Proc Zool Soc Lond. Vol 168, No 1, p 9-49, 1972, Illus.
Identifiers: Distribution patterns, Fauna, Invertebrates, *Profundal fauna, Seasonal, *Wales (Llyn Tegid).

Benthic fauna samples were quantitatively collected each month from the 6-40 m depth zone of Llyn Tegid (Great Britain) for a period of 1 yr. The seasonal distribution, abundance and life cycles of the invertebrate species are discussed in addition to a general description of the physical and chemical environment in which they live. The abundance and composition of the profundal fauna is compared with that of a similar survey carried out by D. R. Dunn in 1951/2 and shows a fourfold increase in total numbers of animals. The contributions to the increased profundal fauna of all animals recorded in 1951/2 and of those that have colonized this zone since that time are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12823

NUTRIENT UPTAKE BY TUPELO GUM AND BALD CYPRESS FROM SATURATED OR UNSATURATED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
R. E. Dickson, T. C. Broyer, and C. M. Johnson.
Plant Soil. Vol 37, No 2, p 297-308, 1972.
Identifiers: Anaerobic conditions, *Bald cypress, Environment, *Nutrient, Nyssa-aquatica, Saturated soil, Taxodium-distichum, *Tupelo gum.

Seedlings of tupelo gum (Nyssa aquatica L.) and bald cypress (Taxodium distichum L. Rich.) were

grown in pots containing a sphagnum moss-peat soil mix. Plants approximately 20-25 cm tall were subjected to 3 moisture treatments, saturated-aerated, saturated, and unsaturated soil; and 3 N fertilization treatments, control (no N added), urea (a reduced N source) and nitrate (an oxidized N source). Data include dry weights (g/culture) of leaves, stems, and roots; concentrations (percentage of dry weight) and contents (mg/culture) of N, P, K, Ca and Mg in leaves, stems and roots. Total dry weight was greater for plants grown in saturated-aerated soil than in either saturated or unsaturated soil. Differences in nutrient abosrption and distribution between the plants and among the water treatments were principally the result of growth differences produced by the water treatments. Element contents and often the concentrations of P, K, Ca or Mg were highest in both species when grown on saturated-aerated soil and lowest when grown on unsaturated soil. The low levels of N in plants grown on saturated soils were probably the result of dentrification, as shown by the greater content of N in plants grown on soil fertilized with urea as opposed to nitrate. Thus, urea would appear to be a better N source than nitrate for fertilization in swamp forests. Growth of, and nutrient uptake by cypress was restricted less than that of Tupelo when the plants were grown on saturated as compared to saturated-aerated soil. Thus, cypress appeared more tolerant than tupelo to the anaerobic root environment found in saturated soil.--Copyright 1973, Biological Abstracts, Inc.
W73-12828

WATER POTENTIAL IN RED PINE: SOIL MOISTURE, EVAPOTRANSPIRATION, CROWN POSITION,
Minnesota Univ., St. Paul. Coll. of Forestry.
E. Sucoff.
Ecology. Vol 53, No 4, p 681-686. 1972. Illus.
Identifiers: Diurnal, *Evapotranspiration, Growth, Patterns, *Pines (Red), Pinus-Resinosa, Soils, Transpiration, *Soil moisture.

Diurnal patterns in leaf water potential (LWP) were examined on 8 red pine (Pinus resinosa Ait) trees throughout 1 summer in northern Minnesota. The daily high in LWP was plotted against total soil moisture to produce a soil-moisture release curve characterizing the plant-soil-atmosphere system. Diurnal patterns in LWP at various soil moistures were compared. Also compared were patterns in LWP under high and low evaporational demand and constant soil moisture. Results were generally consistent with previously constructed models. Very little variation in LWP was observed among whorls or needle ages. Laboratory studies of the effects of LWP when synthesized with data from the forest on occurrence of LWP suggest that growth was limited by water deficit every day of the 1969 summer.--Copyright 1973, Biological Abstracts, Inc.
W73-12837

WATER RELATIONS OF PLANTS IN RAISED SPHAGNUM PEAT BOGS,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
E. Small.
Ecology. Vol 53, No 4, p 726-728. 1972. Illus.
Identifiers: Bogs, Drought, *Peat bogs, Physiological studies, Sphagnum, Woody plants.

The water relations of woody plants of a raised sphagnum peat bog were examined by evaluation of water potential employing the pressure bomb and by measuring transpiration resistance with a leaf-resistance porometer. The plants studied proved to be similar to those of a number of mesophytes growing adjacent to the bog and exhibited no evidence of drought stress. The concept of physiological drought is an inadequate explanation of the extremely xeromorphic characteristics of bog vegetation, which are more plausibly accounted for by other factors.--Copyright 1973, Biological Abstracts, Inc.
W73-12838

THE INFLUENCE OF ORGANIC DRIFT ON THE FOOD HABITS AND LIFE HISTORY OF THE YELLOWFIN SHINER, NOTROPIS LUTIPINNIS (JORDAN AND BRAYTON),
Oklahoma Univ., Norman. Dept. of Zoology.
W. K. Reisen.
Am Midland Nat. Vol 88, No 2, p 376-383. 1972.
Identifiers: *Drift (Organic), Food habits, Invertebrates, Life history, Notropis-Luptipinnis, Organic, *Shiners (Yellowfin), *South Carolina (Praters Creek).

Recent investigations of invertebrate drift have suggested a food chain relationship between riffle-dwelling benthos and lotic fishes, with drift acting as a transport mechanism facilitating predation. A year-long study of N. lutipinnis (Jordan and Brayton), in Praters Creek, Pickens Co., South Carolina, has shown that significant synchronization exists among drift, fish-feeding activity and spawning. A qualitative and quantitative evaluation of adult stomach contents suggested that the drifting invertebrates were consumed in quantities proportional to their composition by weight in the drift. Cyprinidae fry drifted during May when the total invertebrate drift was highest. Drifting fry exhibited a marked nocturnal periodicity with the greatest numbers recovered between 0330 and 0530 AM.--Copyright 1973, Biological Abstracts, Inc.
W73-12844

PHYSIOLOGY AND CYTOLOGICAL CHEMISTRY OF BLUE-GREEN ALGAE,
MSU/AEC Plant Research Lab., East Lansing, Mich.
For primary bibliographic entry see Field 05C.
W73-12845

EXTENSION OF RANGE OF THE TRICLAD TURBELLARIAN PHAGOCATA GRACILIS (HALDEMAN),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. C. Smrchek.
Trans Am Microsc Soc. Vol 91, No 4, p 596-599. 1972. Illus.
Identifiers: Dugesia-dorotocephala, Dugesia-tigrina, *Michigan, Phagocata-gracilis, Phagocata-morgani, Phagocata-velata, Procotyla-fluviatilis, *Triclad turbellarian.

The triclad P. gracilis (Haldeman, 1840) is reported for the first time from Michigan. Numerous individuals were first collected in 1968 in Oden Stream (T35N R4W S18), Emmet County, a cold, spring-fed fish hatchery outlet stream. Ecological data collected over a 2 mo. period and observations on planarian populations are presented. Other species found in the stream include Dugesia dorotocephala, D. tigrina, Phagocata morgani, P. velata, and Procotyla fluviatilis; Dugesia dorotocephala may be unable to compete with Phagocata gracilis.--Copyright 1973, Biological Abstracts, Inc.
W73-12856

THE ASSOCIATION OF AMPHIPODS IN THE SHALLOW-WATER SAND HABITAT OF STRANGFORD LOUGH, CO. DOWN,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-12879

MICRODISTRIBUTION AND DENSITY AS FACTORS AFFECTING THE DOWNSTREAM DRIFT OF MAYFLIES,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
D. M. Lehmkuhl, and N. H. Anderson.
Ecology. Vol 53, No 4, p 661-667. 1972. Illus.
Identifiers: Behavior, Density, Distribution patterns, *Drift, *Mayflies.

During high volume of flow in a stream that has considerable seasonal fluctuation, the microdistribution of 5 species of mayflies was determined by displacement of individuals by drift from rapid current areas to those with gentle or no current. The major effect of drift was dispersal, not depletion, of the mayfly population. Occurrence in drift is determined by a species-specific complex of interdependent factors including life cycle, microdistribution (both before and after the effect of spates), and the behavioral characteristic of individual species.--Copyright 1973, Biological Abstracts, Inc.
W73-12888

DESCRIPTION AND ECOLOGY OF HYAIELLA TEXANA N. SP. (CRUSTACEA: AMPHIPODA) FROM THE EDWARDS PLATEAU OF TEXAS,
Oklahoma Univ., Norman. Dept. of Zoology.
M. M. Stevenson, and A. E. Peden.
The American Midland Naturalist, Vol 89, No 2, p 426-436, April 1973. 7 fig, 6 ref.

Descriptors: *Amphipoda, *Crustaceans, *Ecology, *Systematics, *Speciation, *Texas, Aquatic habitats, Invertebrates, Aquatic animals, Classification, Animal populations, Water temperature.
Identifiers: *Hyalella texana, Hyallela azteca, *Clear Creek (Tex), Arthropods, Animal morphology, Population density, Macroinvertebrates, Scuds.

Hyalella texana, a new species of amphipod crustacean, is described from Clear Creek Spring, Menard County, Texas, 16.7 km W of Menard. It is distinguished from H. azteca, which also occurs at this locality, by the presence of four large tergite spines, enlarged mouth parts, more antennal segments and narrower body and appendage segments. Each species is found predominantly in different habitats of the spring area. (Holoman-Battelle)
W73-12900

SOME MARINE DIATOMS FROM THE GALAPAGOS ISLANDS,
N. I. Hendey.
Nova Hedwigia, Vol 22, Nos. 1-2, p 371-422, 1971. 32 fig, 68 fig.

Descriptors: *Diatoms, *Marine algae, *Speciation, *Classification, Chrysophyta, Varieties, Systematics, Plant groupings, South America, Marine plants.
Identifiers: *Galapagos Islands.

One hundred and seventy-six specific taxa of marine diatoms have been identified and four previously unknown taxa have been described from material collected by Dr. Ira L. Wiggins from Isla Fernandina, Galapgos Islands, on January 27, 1967. The material was taken from foam washed up by surf at Punta Espinosa. The classification used is according to Hendey (1958, 1964). Descriptions are given only of the lesser known taxa. (Holoman-Battelle)
W73-12902

EFFECTS OF AERATION, WATER SUPPLY, AND NITROGEN SOURCE ON GROWTH AND DEVELOPMENT OF TUPELO GUM AND BALD CYPRESS,
Forest Service (USDA), Rhinelander, Wis. North Central Forest Experiment Station.
R. E. Dickson, and T. C. Broyer.
Ecology. Vol 53, No 4, p 626-634, 1972, Illus.
Identifiers: *Aeration, *Cypress (Bald), Fertilizers, Growth, *Gum (Tupelo), Moisture, *Nitrogen, Nyssa-Aquatica, Soils, Taxodium-Distichum, Water supply.

Seedlings of tupelo gum (Nyssa aquatica L.) and bald cypress (Taxodium distichum L. Rich.) were cultured in saturated-aerated, saturated and unsaturated soil. Experiments were designed to measure and evaluate the relative reaction of tupelo and cypress to various soil-moisture conditions, determine the effects of aeration and water availability on plant moisture stress and growth, and compare effects of 2 forms of N fertilizer (urea and nitrate) on growth. On the basis of height and dry weight, both tupelo and cypress grew best in saturated-aerated soil. Growth was better in saturated soil then in unsaturated soil, but only when water in the unsaturated soil decreases substantially below field capacity before rewatering. Plant moisture stress was determined by a pressure-bomb technique. For tupelo, average daily maximum tensions were 7.2 and 7.0 atm (atm±1.013 bar) with saturated and unsaturated soil, respectively; for cypress, comparative tensions were 10.9 and 8.5 atm. When soil moisture decreased from field capacity to the wilting point, the daily maximum tension in plants increased from 7.0 to 12.8 and from 8.5 to 17.6 atm in tupelo and cypress, respectively. Growth of plants was related to the cumulative effect of their internal moisture stress. When tupelo plants were subjected to 595 atm days (daily maximum tension X number of days with that tension), height growth was 37% and dry weight 40% less than plants subjected to 490 atm-days. Fertilization with urea produced more growth than fertilization with nitrate.--Copyright 1973, Biological Abstracts, Inc.
W73-12923

THE PHYSIOGNOMY AND STRUCTURE OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND (SEILI ISLANDS),
Turku Univ. (Finland) Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-12929

EFFECT OF ENVIRONMENTAL FACTORS ON WATER UTILIZATION AND BORON ACCUMULATION AND TRANSLOCATION IN SUGARCANE,
Hawaii Agricultural Experiment Station, Honolulu.
For primary bibliographic entry see Field 03F.
W73-12966

THE DISTRIBUTION OF STREAM-DWELLING TRICLADS (PLATYHELMINTHES) IN NORTH WALES,
Reading Univ. (England). Dept. of Zoology.
J. F. Wright.
Freshwater Biol. Vol 2, No 1, p 57-64. 1972. Illus.
Identifiers: *Distribution patterns (Fauna), Streams, *Triclads (Plathyhelminthes), *Wales.

Information collected during a survey of stream-dwelling triclads in 2 contrasted areas of North Wales is presented. The first study area was located in Caernarvonshire, Wales on the mainland of North Wales and included a mountainous region rising to over 1000 m with abundant cold springs. In contrast, the study area on the nearby island of Anglesey was characterized by relatively warm, slow-flowing streams passing through gently undulating land which did not rise above 153 m. The object of the survey was to collect background data so that suitable streams could be chosen for more intensive studies on factors determining the distribution and abundance of stream-dwelling triclads. Distribution maps for the commonly occurring species were prepared and observations on the relationship between source-type and triclad fauna were obtained. The possible role of interspecific competition was of particular interest.--Copyright 1973, Biological Abstracts, Inc.
W73-12971

GROWTH AND CHEMICAL COMPOSITION OF EIGHT GRASSES GROWN UNDER HIGH WATER TABLE CONDITIONS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
D. V. Waddington, and T. L. Zimmerman.
Commun Soil Sci Plant Anal. Vol 3, No 4, p 329-337. 1972.
Identifiers: Agrostis-Palustris, Agrostis-Tenuis, *Chemical composition (Grasses), Clipping, Eleusine-Indica, Festuca-Arundinacea, Festuca-Rubra, *Grasses, Growth, Lolium-Perenne, Poa-Annua, Poa-Pratensis, Rooting, *Water table, Yields.

Eight grasses (Eleusine indica, Poa annua, P. pratensis, Agrostis tenuis, A. palustris, Festuca arundinacea, F. rubra, Lolium perenne) were grown under high water table conditions for 14 wk in a greenhouse experiment. Water tables were maintained at 2 and 5 inches below the soil surface. Differences in water table depth influenced clipping yields only slightly. Although total root weights were not reduced with the 2-inch water table, there was a trend for fewer roots at lower depths and more roots near the surface with this treatment. The shallowest root systems occurred with annual bluegrass, Kentucky bluegrass and creeping red fescue. Elemental composition of the clippings was influenced by species and time of sampling. The greatest effect of water table depth on elemental content of the clippings occurred with Mn.--Copyright 1973, Biological Abstracts, Inc.
W73-12972

EFFECTS OF WATER STRESS ON NITROGEN--FIXING ROOT NODULES: IV. EFFECTS ON WHOLE PLANTS OF VICIA FABA AND GLYCINE MAX,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
For primary bibliographic entry see Field 03F.
W73-12977

THE SELECTION OF EUCALPTS FOR REGENERATION,
Australian National Univ., Canberra. Dept. of Botany.
L. D. Pryor.
Appita. Vol 26, No 1, p 35-38. 1972.
Identifiers: Eucalpts, *Eucalptus, Fire Rainfall, *Regeneration.

Species of winter rainfall areas fall in summer rainfall zones but the reverse is not the case. Species from cooler zones fail in subtropical lowland situations. Species of the Monocalyptus group are usually more difficult to transfer 'off-site' than species in other groups. Species known to be limited in their natural range by fire, if fire protected, can be extended readily into sites adjoining those of their natural occurrence.--Copyright 1973, Biological Abstracts, Inc.
W73-12980

STUDIES ON HELMINTHS OF NORTH DAKOTA: IV. PARASITES OF THE RIVER CARPSUCKER, CARPIODES CARPIO, WITH DESCRIPTIONS OF THREE NEW SPECIES (MONOGENEA),
Minot State Coll, N. Dak. Dept. of Biology.
D. C. Kritsky, P. D. Leiby, and M. E. Shelton.
J Parasitol. Vol 58, No 4, p 723-731. 1972. Illus.
Identifiers: Anonchohaptor-Muelleri, Camallanus-Ancylodirus, Carpiodes-Carpio, *Carpsucker, Gyrodactylus-Dakotensis, *Helminths, Icelanonchohaptor-Microcotyle, Monogenea, Neodiscocotyle-Carpioditis, *North Dakota, Parasites, Pellucidhaptor-Eremitis, Pellucidhaptor-Micracanthus.

Three trematodes (Monogenea:Dactylogyridae), Anonchohaptor muelleri, Icelanochohaptor microcotyle and Pellucidhaptor micracanthus, are described from Carpiodes carpio (Raf.) from the Missouri River in North Dakota and South Dakota. The generic diagnoses of Anonchohaptor Mueller, 1938, and Pellucidhaptor Price and Mizelle, 1964, are emended. The finding of Gyrodactylus dakotensis Leiby et al., 1972, Neodiscocotyle carpioditis Dechtiar, 1967, P. eremitis Rogers, 1957 (monogenetic trematodes), and Camallanus ancylodirus Ward and Magath, 1916 (nematode), from C. carpio constitute new host records. Also, 7 new locality records are established, 6 of which are reported for the first time from the upper Missouri River.--Copyright 1973, Biological Abstracts, Inc.
W73-12984

CONTRIBUTIONS TO THE LIFE HISTORY OF THE PIUTE SCULPIN IN SAGEHEN CREEK, CALIFORNIA,
National Marine Fisheries Service, Miami, Fla. Southeast Fisheries Center.
A. C. Jones.
Calif Fish Game. Vol 58, No 4, p 285-290. 1972.
Identifiers: *California, Cottus-Beldingi, History, Insects, Larvae, *Piute sculpin, Sagehen Creek (Calif), Salmo-Gairneri, Salmo-Trutta, Salvelinus-Fontinalis, Sculpin.

The Piute sculpin, Cottus beldingi Eigenmann and Eigenmann, is the dominant fish by number of weight in Sagehen Creek, a mountain stream on the east slope of the Sierra Nevada. Sculpins are at their greatest density in the middle of the creek where they, along with brook trout (Salvelinus fontinalis) and rainbow trout (Salmo gairdneri), find good foraging for bottom dwelling aquatic insect larvae. The numbers of sculpins are low in the precipitous headwaters of Sagehen Creek and also low in the lower reaches of the stream, which are frequented by their chief predator, the brown trout (Salmo trutta), and by other fishes. Sculpins in Sagehen Creek and Lake Tahoe exhibit minor differences in growth and reproduction but appear to occupy a similar ecological niche in the 2 areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12986

PARASITISM OF MOSQUITOES BY WATER MITES,
Ohio Dept. of Health, Columbus. Div. of Communicable Diseases.
M. Jalil, and R. Mitchell.
J Med Entomol. Vol 9, No 4, p 305-311. 1972. Illus.
Identifiers: Abundance, Morphology, *Mosquitoes, Parasitisms, Pionid, Population, Thyasid, *Ohio, *Water mites.

A large sample of Ohio mosquitoes was parasitized by 2 kinds of water mites. Thyasid-type mites walk on the water surface and encounter hosts there while the pionid-type larvae are strictly aquatic. The 2 types of larvae differ greatly in general morphology. Both kinds of larvae are locally abundant in Ohio but the species and their degree of host specificity remain to be worked out. A few local populations of mosquitoes are so heavily infested that the mites could serve as useful markers in studies of these populations. The discouraging results attempts to use water mites as markers are due to failure to separate records and identify kinds of mite larvae. When records are not pooled and the biology of the mite given due consideration, it is possible to use the parasitic larvae in distribution and age-grading studies of their host mosquitoes.--Copyright 1973, Biological Abstracts, Inc.
W73-12987

CHARACTERIZATION OF EXUDATION FROM EXCISED ROOTS OF ONION, ALLIUM CEPA: I. WATER FLUX,
Liverpool Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 03F.
W73-12989

EFFECT OF TIME, WATER FLOW AND PH ON CENTRIPETAL PASSAGE OF RADIOPHOSPHORUS ACROSS ROOTS OF INTACT PLANTS,
Connecticut Univ., Storrs. Dept. of Plant Science.
For primary bibliographic entry see Field 05B.
W73-12991

2J. Erosion and Sedimentation

THE SEDIMENTS AND HISTORY OF LAKE BUTTE DES MORTS, WISCONSIN,
Wisconsin State Univ., Oshkosh. Limnology Lab.
J. W. McKee, and J. S. Laudon.
Available from the National Technical Information Service as PB-222 273, $3.50 paper copy, $1.45 in microfiche. Report of Investigations Number 3, March 1972. 55 p, 15 fig, 4 ref. OWRR A-019-WIS (1). OWRR A-030-WIS (1). 14-01-0001-1870, 14-31-0001-3050.

Descriptors: *Sediments, *Erosion, Vegetation effects, Interfaces, *Glacial drift, Lakes, *Marsh plants, *Lake sediments, Geologic history, *Wisconsin.
Identifiers: *Lake Butte des Morts (Wis).

Study of the sediments of Lake Butte des Morts, Wisconsin, and their stratigraphic relationships, has produced a history of lake evolution from the early years of the last deglaciation. Samples of bottom sediment (at the sedimentary interface) were taken from locations selected to represent each environment of deposition in the lake. In the laboratory cores were extruded from the plastic corer liners for analysis and the sediments were divided into eleven types. These sediment types are not intended to represent stratigraphic units though some may exist as a unit and may be conceptually categorized as a rock-stratigraphic unit--e.g.--the red varved clay. The paleolimnological approach provides background information of value in the management of lakes and also adds some detail to the knowledge of local natural history. (Kerrigan-Wisconsin)
W73-12355

ASPECTS OF THE BIOGEOCHEMISTRY OF CARBOHYDRATES AND PROTEINS IN AQUATIC ENVIRONMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-12371

STRATIGRAPHY OF FOSSIL PIGMENTS AS A GUIDE TO THE POSTGLACIAL HISTORY OF KIRCHNER MARSH, MINNESOTA,
Ohio Wesleyan Univ., Delaware. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 05C.
W73-12386

SEDIMENT-WATER NUTRIENT INTERCHANGE IN EUTROPHIC LAKES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05C.
W73-12395

CATASTROPHIC ROCK SLIDE, MOUNT HUASCARAN, NORTH-CENTRAL PERU, MAY 31, 1970,
J. M. Browning.
American Association of Petroleum Geologists Bulletin, Vol 57, No 7, p 1335-1341, July 1973. 8 fig, 5 ref.

Descriptors: *Rockslides, *Landslides, *Debris avalances, *Disasters, Avalanches, South America, Mass wasting, Sediment transport, Sedimentation.
Identifiers: *Peru, *Mt Huascaran.

A catastrophic rockslide involving over 2 million cu m of rock moved down the valley of the Llanganuco River, and split into two lobes, one of which killed approximately 2,000 people in the town of Rangrahirca and the other killed approximately 19,00 people in the town of Yungay. The slide was triggered by an earthquake 85 km away, at a depth of 54 km. In the upper and steepest drop the slide fell and swept as a nearly friction-free unit mass a distance of 14.5 km, a vertical drop of 13,700 ft, in 3 minutes. Over the next 50 km the slide moved as a fluid mass, covering the distance in 2 hours. Deposition from the slide was velocity-dependent. (Knapp-USGS)
W73-12409

CHARACTERISTIC PHYSICAL AND BIOGENIC SEDIMENTARY STRUCTURES IN GEORGIA ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 02L.
W73-12410

GLACIAL ENVIRONMENT AND PROCESSES IN SOUTHEASTERN ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
For primary bibliographic entry see Field 02C.
W73-12423

BUREAU OF RECLAMATION PROCEDURES FOR PREDICTING SEDIMENT YIELD,
Bureau of Reclamation, Denver, Colo.
R. I. Strand.
Paper, Sediment Yield Workshop, USDA Sediment Lab, Oxford, MS, Nov 1972. 15 p, 3 fig, 4 tab, 5 ref.

Descriptors: *Sediment transport, Sediment load, Bed load, *Sedimentation, Analytical techniques, Sedimentation rates, Sediment discharge, Storage capacity, Drainage systems, Runoff, Watersheds (Basins), On-site data collections, Forecasting.
Identifiers: San Juan River, Lake Havasu, Sediment rating curves, Runoff plot, Flow duration curves, Calculations.

The techniques used by the Bureau of Reclamation for predicting sediment yields vary depending on data available and complexity of the problem. For situations involving large reservoirs with large drainage areas and significant sediment inflows, the flow-duration, sediment rating curve procedure is used with corrections for unmeasured load. An example using this procedure is given for the San Juan River and indicates 58% of the annual sediment yield occurs during the thunderstorm period, although the runoff during that period is only 36% of the average annual value. In another situation where Alamo Dam was closed upstream of Lake Havasu, sediment yield rate curves were used to calculate the new sediment yield. These curves are developed by plotting the sediment yield per unit area per year against the drainage area for watersheds with similar climatic, topographic, and geologic conditions. For smaller drainage systems intersected by conveyance systems, predicting sediment yield is more difficult and further study is needed. (USBR)
W73-12479

SEA-LAND NAVIGATION STUDIES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12567

SHOALING CONDITIONS, ST. LOUIS HARBOR, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12570

LEAD POLLUTION: RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-12589

RIVER CHANNEL CHANGE WITH TIME: AN EXAMPLE,
Geological Survey, Berkeley, Calif.
L. B. Leopold.
Geological Society of American Bulletin, Vol 84, No 6, p 1845-1860, June 1973. 17 fig, 3 tab, 4 ref.

Descriptors: *Alluvial channels, *Urbanization, *Geomorphology, *Meanders, Erosion, Sedimentation, Runoff, Discharge (Water), Urban hydrology, Channel morphology, Flood plains.
Identifiers: Rockville (Md).

Channel cross sections were surveyed over a period of 20 years (1953 to 1972) to determine the amount and kind of change of channel area and position of a 3.7-sq-mi basin, Watts Branch, near Rockville, Maryland. For the first 12 years, the channel progressively but slowly became smaller as urbanization of the basin gradually proceeded. After 1966, a threshold of change apparently was passed and, probably as a result of an increased rate of land alteration upstream, large amounts of sediment were deposited within the channel and overbank. The number of floods exceeding channel capacity increased from two to more than 10 per year. Simultaneously, the channel area began to increase. Despite the trend toward increasing cross-sectional area, the net result after 20 years was a channel smaller by 20% than it had been originally. Urbanization did not alter the rate of channel migration. (Knapp-USGS)
W73-12590

SEA FLOOR OFF MAGDALENA DELTA AND SANTA MARTA AREA, COLOMBIA,
Scripps Institution of Oceanography, La Jolla, Calif.
F. P. Shepard.
Geological Society of America Bulletin, Vol 84, No 6, p 1955-1972, June 1973. 12 fig, 11 ref. ONR Contract N00014-69-A-0200-6006; NSF Grant GA-4593.

Descriptors: *Bottom sediments, *Submarine canyons, *Deltas, Topography, Sedimentation, Continental shelf, Sounding, Stratigraphy, Sedimentary structures, South America, Structural geology.
Identifiers: Andes, Colombia.

The undersea slope bordering the Magdalena delta and the adjacent Andes has a complex morphology. This includes typical delta-front valleys directly off the Magdalena River and off its old mouths. The area is bordered to the west by anticlinal hills and synclinal valleys, and to the north by fault blocks with a northeasterly trend. To the east, the slope has mud diapirs rising mostly from between 730 and 1,370 m. Off the mountainous coast east of Santa Marta, a large submarine canyon winds down the slope almost to Colombia Basin. The sea-floor relief was formed by a combination of complex faulting and folding, sedimentation from the Magdalena (with attendant formation of slump valleys), partial filling of structural valleys, diapiric intrusion of plastic mud from underlying formations, and marine erosion of a large submarine canyon. (Knapp-USGS)
W73-12591

COMPUTER MODELS OF DELTA GROWTH DUE TO SEDIMENT INPUT FROM RIVERS AND LONGSHORE TRANSPORT,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar.
Geological Society of America Bulletin, Vol 84, No 7, p 2217-2226, July 1973. 9 fig, 2 tab, 16 ref. NOAA Sea Grant 2-35187.

Descriptors: *Deltas, *Sediment transport, *Waves (Water), *Simulation analysis, Mathematical models, Sedimentation, Littoral drift.

Computer-simulation models were developed to investigate the growth and equilibrium shape of a river delta in which wave action is the dominant force in redistributing sands. The models appear to yield reasonable comparisons with real beaches and delta shapes. The models indicate that the deltas quickly reach an equilibrium configuration in which the wave energy flux is just capable of transporting and redistributing along the shore all the sand supplied by the river. The wave breaker angle decreases systematically along the delta away from the river mouth due to a progressive decrease in the quantity of river sand remaining to be transported. When the wave energy flux is low or the river sediment supply too high for the existing waves nearly all the sand remains near the river mouth, producing one distributary which, if duplicated, would form a bird-foot delta. Oblique wave approaches produced asymmetric deltas, but the asymmetry was not as pronounced as anticipated. (Knapp-USGS)
W73-12592

BLACK PHYTOKARST FROM HELL, CAYMAN ISLANDS, BRITISH WEST INDIES,
Texas Univ., Austin. Dept. of Geology.
R. L. Folk, H. H. Roberts, and C. H. Moore.
Geological Society of America Bulletin, Vol 84, No 7, p 2351-2360, July 1973. 12 fig, 39 ref.

Descriptors: *Karst, *Algae, *Vegetation effects, *Weathering, Carbonate rocks, Geomorphology, Topography, Limestones, Dolomite.
Identifiers: *Cayman Islands, *Phytokarst.

Phytokarst is a distinctive landform resulting from a curious type of biologic erosion. Filamentous algae bore their way into limestone to produce black-coated, jagged pinnacles marked by delicate, lacy dissection that lacks any gravitational orientation. Ordinary rainfall-produced karst and littoral karst are characterized by flat-bottomed pans and vertically oriented flutes, thus differing from phytokarst. Algae attack by dissolving calcite preferentially to dolomite. (Knapp-USGS)
W73-12593

WIND-DRIVEN MODEL FOR EVAPORITE DEPOSITION IN A LAYERED SEA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
W. D. Stuart.
Geological Society of America Bulletin, Vol 84, No 8, p 2691-2704, August 1973. 11 fig, 1 tab, 28 ref.

Descriptors: *Chemical precipitation, *Evaporation, *Salts, *Brines, *Mathematical models, Sea water, Numerical analysis, Finite element analysis, Water chemistry, Water circulation.
Identifiers: *Evaporites.

Deposition of evaporites in a salinity- and density-layered sea is examined by theoretically predicting the large-scale circulation in a simplified model sea. In the constant-depth model, vertical stratification is represented by two homogeneous layers; the upper layer is normal or slightly concentrated seawater, and the considerably denser lower layer is saturated with respect to halite. Each layer has a constant density and volume. The horizontal transport form of the time-dependent equations of motion and continuity for each layer are solved numerically by a finite-difference method. Interface stresses acting between the two layers and bottom stresses acting between the lower layer and the bottom allow consideration of vertical turbulent friction. Forcing is by a constant and uniform wind stress acting on the free surface. Rotation and hydrostatic pressure gradient terms are also included in the equations of motion. (Knapp-USGS)
W73-12594

LONG-LIVED POLLUTANTS IN SEDIMENTS FROM THE LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12595

THEORY OF WATER MOVEMENT IN SOILS: 10. CAVITIES WITH CONSTANT FLUX,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 02G.
W73-12600

ERODIBILITY OF HILL SOILS OF SUTLEJ CATCHMENT AREA IN HIMACHAL PRADESH,
Indian Agricultural Research Inst., New Delhi. Div. of Soil Science and Agricultural Chemistry.
R. R. Sharma, and N. R. D. Biswas.
Indian J Agric Sci. Vol 42, No 2, p 161-169. 1972.
Identifiers: Catchments, Cation, Clay, Dispersion, *India, Sand, *Soils, Sutlej catchment, *Erosion ratios.

The mechanical composition and other physical and physicochemical properties of 4 soil profiles in the sub-watershed of Sirkhad, were determined. Erosion ratios of these soils were correlated with dispersion ratio, clay:moisture-equivalent ratio, fine sand:silt + clay ratio, sand:silt + clay ratio, fine sand:clay ratio, and with the cation exchange capacity of the soils. The high 'r' value indicates that the ratio of fine sand:silt clay may also be considered a suitable index to help the prediction of erodibility of these soils. Soils derived from shales show high erosion ratios on the surface, and consequently suffer from sheet erosion, in contrast to the gully erosion suffered by the soils derived from sandstones, which show higher ratios through the profile depth.--Copyright 1973, Biological Abstracts, Inc.
W73-12635

SEDIMENT RESULTING FROM CONSTRUCTION OF AN INTERSTATE HIGHWAY IN THE PIEDMONT AREA OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 04C.
W73-12713

A SUGGESTED NEW APPROACH TO THE ANALYSIS OF DRAINAGE BASIN SHAPES,
Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 04A.
W73-12729

OBSERVATIONS OF TUFA DEPOSITION,
Hull Univ. (England).
For primary bibliographic entry see Field 02K.
W73-12730

TERRACETTES: A SUGGESTED CLASSIFICATION,
Manchester Univ. (England).
E. W. Anderson.
Area (Institute of British Geographers), Vol 4, No 1, p 17-20, 1972. 7 ref.

Descriptors: *Geomorphology, *Slopes, *Grazing, *Erosion, Soil erosion, Terraces (Geologic), Topography.
Identifiers: *Terracettes, England, Scotland.

Terracettes, which are small breaks in slopes, are produced by grazing animals. Field measurements taken of terracette morphology allow a broad classification to be made. Two basic types can be distinguished: (1) normal terracettes with wide risers at a similar angle to that of the slope, and long, unbroken treads parallel to each other and normal to the slope; (2) tear terracettes with narrow, steep risers generally lacking in vegetation, and short treads which are rarely parallel or normal to the slope. Normal terracettes occur in areas of permanent pasture on predominantly mineral soils, while tear terracettes are usually found in areas of rough grazing where there is a marked organic horizon. (Knapp-USGS)
W73-12731

TRIALS ON TRENDS THROUGH CLUSTERS OF CIRQUES,
Monash Univ., Clayton (Australia).
G. Robinson.
Area (Institute of British Geographers), Vol 4, No 2, p 104-113, 1972. 2 fig, 5 tab, 22 ref.

Descriptors: *Cirques, *Snow, *Statistical methods, *Paleoclimatology, *Pleistocene epoch, Geomorphology, Correlation analysis, Variability, Glaciation.
Identifiers: *Snowlines.

When a Pleistocene snowline is plotted from a sampled population of cirque altitudes, the sampling unit by its very nature cannot be observed uniformly over space. The factors that favor a site's occupance and excavation by ice tend to produce clusters of cirques in particular parts of mountain ranges. Further, the locations of the mountain ranges are themselves frequently clustered. Thus, the total identified and measurable population of cirques studied in Tasmania is predominantly located in clusters of clusters. To examine the effects of reducing spatial clustering, a comparison is made between quadratic trend surfaces fitted to four samples of Tasmanian cirques with varying degrees of clustering, using direct correlation, analysis of variance, correlation of the trend parameters, and comparison of the reductions of sum of squares. No major differences among surfaces are revealed, and it is concluded that with a large number of highly clustered observations the empirical choice of control point distrubution depends more reasonably upon operational exigencies than upon the fear of distortion associated with clustering. (Knapp-USGS)
W73-12732

EXPERIMENTAL INVESTIGATION OF ROCK WEATHERING BY SALTS,
Oxford Univ. (England).
For primary bibliographic entry see Field 02K.
W73-12733

SOME EXAMPLES OF DRAINAGE COMPONENT ANALYSIS,
Malaya Univ., Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 04A.
W73-12734

A NOTE ON STREAM ORDERING,
University Coll. of Wales, Aberystwyth.
For primary bibliographic entry see Field 04A.
W73-12735

THE SUPERIMPOSITION HYPOTHESIS FOR INCISED MEANDERS--A GENERAL REJECTON AND SPECIFIC TEST,
Makerere Univ., Kampala (Uganda).
For primary bibliographic entry see Field 02E.
W73-12736

CLIMATIC CHANGE AND ARRESTED MEANDER DEVELOPMENT ON THE RIVER SEVERN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 04A.
W73-12737

HISTORY OF SEDIMENTATION IN MONTSWEAG BAY,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
For primary bibliographic entry see Field 02L.
W73-12740

KARST OF THE ARABIKA MASSIF (KARST MASSIVA ARABIKA),
For primary bibliographic entry see Field 02K.
W73-12742

THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12843

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W73-12846

NITROGEN RELEASE FROM LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05B.
W73-12860

LITHIUM SILICATE SEDIMENTATION TRACER FOR SHOAL DEPOSIT STUDIES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W73-12862

THE REDUCTION OF COPPER TOXICITY IN A MARINE COPEPOD BY SEDIMENT EXTRACT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-12909

PHOSPHATE CHEMISTRY IN LAKE SEDIMENTS,
Massey Univ., Palmerston North (New Zealand).
For primary bibliographic entry see Field 05C.
W73-12917

DETERMINATION OF ALKYLBENZENESULFONATE (ABS) IN BOTTOM SEDIMENT,
Tokyo Metropolitan Univ., Tokyo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-12932

STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY.

New Jersey State Soil Conservation Committee Publication, 1972. 116 p.

Descriptors: *Erosion control, *Sediment control, *Soil erosion, *Land development, *New Jersey, Urbanization, Sediment transport, Sedimentation, Water pollution, Bank protection, Check structures, Land management, Vegetation establishment, Slope stability.
Identifiers: *Erosion control guidelines.

The last several decades of rapid suburban development in the state of New Jersey have resulted in the erosion of soil by both wind and water. Standards and recommendations are presented to provide local governments, developers, and technical personnel with erosion control techniques. Effective erosion control begins in the project planning stage. Proper planning requires consideration of water control and soils to be encountered in order to reduce erosion problems during and after construction. Steep slopes, potential landslide areas, stream crossings, stream encroachments, and cut and fill sections should be evaluated for construction problems involved in reducing erosion and the resulting sediment damage to streams and water supplies. The evaluation of soils, existing vegetation, and geologic and hydrologic data is necessary to define problem areas. Every consideration should be given to assure the successful establishment of vegetation on disturbed areas as quickly as possible in order to minimize erosion and sediment damage. (Woodard-USGS)
W73-12956

CHANNEL EROSION SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971,
Geological Survey, Anchorage, Alaska.
J. M. Childers.
Basic-data report, October 1972. 79 p, 62 fig, 1 tab, 8 ref.

Descriptors: *Channel erosion, *Pipelines, *Oil industry, *Alaska, Environmental effects, Conveyance structures, Oil, Surveys, Aerial photography, Planning, Sediment transport, Sediment control, Erosion control, Storms, Stream erosion, Streambeds, Evaluation, Data collections, Engineering.
Identifiers: *Trans-Alaska Pipeline System, Preconstruction data.

The U.S. Geological Survey has the threefold responsibility along the proposed route of the Trans-Alaska Pipeline System (TAPS) to investigate possible hydrologic hazards to the pipeline, to investigate possible impacts of the pipeline on water resources, and to develop a better understanding of Arctic hydrology. Because the proposed pipeline route lies within many stream channels, one of the obvious hydrologic hazards is channel erosion. Descriptions of preconstruction conditions are provided at selected channel sites along the northern segment of the TAPS from Prudhoe Bay to the Salcha River. The information could be used in studies of severe channel erosion, streambed scour, bank erosion, or rechannelization. Included is a plan for detecting and measuring significant erosion and the important factors causing the erosion, such as flood discharge, icing, and construction activities. Vertical aerial photography at most sites was obtained during low-flow, open-water conditions to provide a basis for evaluating changes that may be caused by construction and erosion. (Woodard-USGS)
W73-12957

TRACE METAL BASELINE STUDIES ON THE MURDERKILL AND ST JONES RIVERS, DELAWARE COASTAL PLAIN,
Delaware Univ., Newark. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12959

2K. Chemical Processes

SELECTED DATA ON WELLS IN THE BARSTOW AREA, MOJAVE RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 04B.
W73-12421

THE EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05A.
W73-12426

HYDROLOGICAL YEAR-BOOK OF ISRAEL, 1970/71.
Ministry of Agriculture, Jerusalem (Israel). Water Commission.
For primary bibliographic entry see Field 02A.
W73-12432

TRITIUM MEASUREMENT OF NATURAL WATERS ON OAHU, HAWAII: A PRELIMINARY INTERPRETATION (SAMPLING PERIOD: JULY 1969 TO JUNE 1970),
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W73-12499

SETTLEABLE MATTER IN WASTE WATER. SCAN-W7:72.
Scandinavian Pulp, Paper and Board Testing Committee, Stockholm (Sweden).
For primary bibliographic entry see Field 05A.
W73-12530

DETERMINATION OF ORGANIC SUBSTANCES IN INDUSTRIAL EFFLUENTS (NEKTERE MOZNOSTI STANOVENI ORGANICKEHO ZNECISTENI ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05A.
W73-12532

GROUND-WATER RESOURCES, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12578

BLACK PHYTOKARST FROM HELL, CAYMAN ISLANDS, BRITISH WEST INDIES,
Texas Univ., Austin. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-12593

WIND-DRIVEN MODEL FOR EVAPORITE DEPOSITION IN A LAYERED SEA,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W73-12594

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05A.
W73-12601

INVESTIGATION OF MINERAL NUTRIENT CYCLING IN UPLAND PIEDMONT FOREST,
Forest Service (USDA), Research Triangle Park, N.C. Forest Science Lab.
For primary bibliographic entry see Field 04A.
W73-12700

WATER QUALITY IN THE MIDDLE FORK FEATHER RIVER, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W73-12720

OBSERVATIONS OF TUFA DEPOSITION,
Hull Univ. (England).
A. F. Pitty.
Area (Institute of British Geographers), Vol 3, No 3, p 185-189, 1971. 1 fig, 1 tab, 18 ref.

Descriptors: *Calcium carbonate, *Chemical precipitation, *Mosses, Limestones, Carbon dioxide, Water chemistry.
Identifiers: *Tufa.

Tufa formation seems always to be associated with the presence of either mosses or algae. The seasonal change in response of plant activity to varying intensities of radiant energy supply may be detected in the process of tufa deposition. In many situations, therefore, palaeoclimatic reconstructions of the environment in which fossil tufas accumulated should consider the effect of varying climatic conditions on the activity of tufa-depositing organisms as well as inferring how such changes might affect purely physicochemical processes that could theoretically be involved in tufa deposition. For instance, features of the maritime climate in Britain, especially the high precipitation and mild temperatures without extremes, contribute to the luxuriant growth of mosses. In particular, seasonal contrasts in calcium carbonate deposition are emphasized, and it is suggested that their study is one of the best ways of approaching the problem of specifying the conditions favoring or retarding tufa deposition over contrasted but much longer spans of Quaternary time. (Knapp-USGS)
W73-12730

EXPERIMENTAL INVESTIGATION OF ROCK WEATHERING BY SALTS,
Oxford Univ. (England).
A. Goudie, R. Cooke, and I. Evans.
Area (Institute of British Geographers), No 4, p 42-48, 1970. 3 fig, 1 tab, 7 ref.

Descriptors: *Weathering, *Salts, *Water chemistry, Hydration, Crystallization, Rock properties.

Disintegration of rocks by salts, which takes place in such diverse environments as deserts, coasts, polar areas, lakeshore, and cities, is accomplished by three principal processes: growth of crystals from solution, expansion on hydration, and thermal expansion. A series of experiments was designed to explore certain aspects of these problems. Rock samples of approximately similar initial weight, shape, and size were immersed in saturated salt solution at 17-20 deg C for one hour. They were then removed and dried in an oven, using a temperature of 60 deg C for six hours, and a temperature of 30 deg C for the remainder of each 24-hour cycle. The procedure was repeated 40 times. Na2S04 was consistently the most effective salt in causing splitting. Only sedimentary rocks were affected by splitting. Weight losses through splitting of granular disintegration by salt crystallization reflect the influence of a large number of variables. Environmental variables include the salts involved and their concentrations, the thermal regime, degree of supersaturation reached, and duration of exposure to supersaturated solutions. The effect of different salts is a function of such properties as volume increase on crystallization, rate of change of solubility with temperature, and thermal coefficients of volumetric expansion. Relevant rock properties include percentage absorption of solution, rate of solution penetration and other properties related to these, tensile strength, the nature and distribution of structural weakness, and geometric attributes of the specimens. (Knapp-USGS)
W73-12733

BIOGEOCHEMISTRY OF SEDIMENTS OF DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-12739

KARST OF THE ARABIKA MASSIF (KARST MASSIVA ARABIKA),
T. Z. Kiknadze.
Izdatel'stvo 'Metsniyereba', Tbilisi, 1972. 248 p.

Descriptors: *Karst, *Karst hydrology, *Mountains, Geology, Geologic history, Geologic time, Geomorphology, Topography, Petrology, Stratigraphy, Hydrogeology, Groundwater, Water chemistry, Corrosion, Caves, Limestones, Subsurface drainage, Snow, Ice, Maps.
Identifiers: *USSR (*Abkhazia), *Arabika massif, Karst landforms, Tectonics.

Investigations were carried out in northwestern Abkhazia in 1960-68 to study geological and hydrogeological conditions of karst development on the Arabika massif, one of the most comples karst regions in the world. Data on chemical erosion in the region are tabulated and mapped, and karst landforms and factors controlling development of karst (tectonics, chemical composition of rocks, lithology, and soil-vegetal cover) are described. (Josefson-USGS)
W73-12742

HYDROCHEMICAL DESCRIPTION OF THE ONON-ARGUN' STEPPE (GIDROKHIMICHESKAYA KHARAKTERISTIKA ONON--ARGUNSKOY STEPI),
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).
V. A. Snytko, and V. A. Alekseyenko.
Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 30, p 37-44, 1971. 2 fig, 4 tab, 14 ref.

Descriptors: *Water chemistry, *Water quality, *Water analysis, *Inorganic compounds, *Grasslands, Rivers, Lakes, Groundwater, Ions, Hardness (Water), Salinity, Temperature.
Identifiers: *East Siberia, *Chita Oblast, *Onon-Argun' steppe, Mineralization.

Delineation of the Onon-Argun' steppe into hydrochemical zones was based on detailed investigations of chemical composition of natural waters in southeastern Chita Oblast in 1968-70. Seven zones were identified: (1) Onon region of calcium bicarbonate waters: (2) Torey region of sodium bicarbonate waters; (3) Borzya region of bicarbonate sulfate waters; (4) Kharanor region of sodium chloride waters; (5) Nerchnisk region of calcium bicarbonate waters; (6) Klichka region of magnesium bicarbonate waters; and (7) Argun' region of calcium bicarbonate waters. Quality-of-water data are presented for the different regions. (Josefson-USGS)
W73-12746

SILICA IN THERMAL AND COLD WATERS (KREMNEZEM V TERMAL'NYKH I KHOLODNYKH VODAKH),
G. V. Bogomolov, G. N. Plotnikova, and Ye. A. Titova.
Izdatel'stvo 'Nauka', Moscow, 1967. 112 p.

Descriptors: *Geochemistry, *Silica, *Water types, *Groundwater, *Thermal water, Mineral water, Springs, Hot springs, Geysers, Cold springs, Freshwater, Wells, Artesian aquifers, Structural geology, Water temperature, Carbon dioxide, Solubility, Hydrogen ion concentration, Chemical analysis, Sampling.
Identifiers: *USSR, Mineral springs, Mineralization, Tectonics.

Silica concentrations in thermal and cold groundwaters were investigated in platform and folded-mountain areas of the USSR and in individual foreign countries. Solubility of silica, modes of its migration in water, and basic factors affecting passage of silica into natural waters are described, and maximum concentrations of silica are given for different groundwater types. The data obtained are important in evaluating the role of groundwater in migration and redistribution of silica in the earth's crust. (Josefson-USGS)
W73-12751

DETERMINATION OF EXCHANGEABLE CATIONS IN CALCAREOUS SOILS,
Centro de Edafologia y Biologia Aplicada del Segura, Murcia (Spain).
For primary bibliographic entry see Field 02G.
W73-12786

RAPID FIELD DETERMINATION OF NITRATE IN NATURAL WATERS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
T. A. Ranney, and R. J. Bartlett.
Commun Soil Sci Plant Anal. Vol 3, No 3, p 183-186. 1972.
Identifiers: *Brucine, *Nitrates, Soils, Soil extracts.

Brucine, an organic reagent used for nitrate determinations, proved stable for at least 1 yr when dissolved in methanol. This makes possible a consistently accurate and rapid method for field determinations of nitrate in clear solutions with a minimum of equipment. The method is also useful in the laboratory for determining nitrate in water or soil extracts. It is quicker and simpler than other colorimetric methods and more sensitive to low concentrations than the nitrate electrode.--Copyright 1972, Biological Abstracts, Inc.
W73-12810

PHOTOSULFOXIDATION OF HYDROCARBONS IN THE LIQUID PHASE,
Battelle Columbus Labs., Ohio.
P. W. Jones, and A. H. Adelman.
Environ Sci Technol. Vol 6, No 10, p 933-934. 1972. Illus.
Identifiers: Carbons, *Hydro carbons, Liquid phase, Oxidation, *Photo sulfoxidation, Quenching, Sulfur.

Aliphatic alkanes and alkenes were irradiated with UV light (Lambda ± or > 2900 A) in the liquid phase, in the presence of SO2 and O2. Both the hydrocarbon reactivity and the nature of products formed in solution show significant similarities to experiments involving aerosols under atmospheric conditions. However, studies in the former system are greatly facilitated by the superior yield of products. The mechanism of triplet SO2 quenching, to form photosulfoxidation products, is duscussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12833

VOLTAMMETRIC STUDY OF THE HYDROGEN ION/HYDROGEN COUPLE IN ACETONITRILE/WATER MIXTURES,
Tennessee Univ., Knoxville. Dept. of Chemistry.
J. A. Lanning, and J. Q. Chambers.
Analytical Chemistry, Vol 45, No 7, p 1010-1016, June 1973. 7 fig, 3 tab, 48 ref.

Descriptors: *Electrochemistry, *Aqueous solutions, Chemical reactions, Chemical analysis, Solvents.
Identifiers: *Perchloric acid, *Voltammetry, *Nonaqueous solutions, *Platinum electrodes, *Mixtures, Acetonitrile, Reproducibility, p-Benzohydroquinone, Proton diffusion coefficients.

A voltammetric study at polished platinum electrodes of perchloric acid in acetonitrile/water mixtures is reported. The half-wave potentials of the proton reduction wave (ferrocene scale) and the viscosity of acetonitrile/water mixtures indicate that acetonitrile structures water in the 0.80 to 0.95 mol fraction of water region. The proton is most difficult to reduce (E sub 1/2 most negative) at 0.85 mol fraction of water. Acetonitrile proved to be a poor solvent for the generation of dry protons. Chemical reactions occur in H (plus)/H2/CH3CN mixtures which depend on the nature of the generation technique employed. Solvent effects effects on the cyclic voltammograms of p-hydrobenzoquinone in acetonitrile-water mixtures were used to aid in the identification of product reduction waves. The wave assigned to the reduction of protonated benzoquinone was independent of solvent composition, in marked contrast to the reduction of solvated protons. (Holoman-Battelle)
W73-12872

SODIUM TUNGSTEN BRONZE AS A POTENTIOMETRIC INDICATING ELECTRODE FOR DISSOLVED OXYGEN IN AQUEOUS SOLUTION,
Ames Lab., Iowa.
For primary bibliographic entry see Field 05A.
W73-12873

INSTRUMENTAL AND NUMERICAL CONSIDERATIONS FOR ON-LINE INTERPRETATION OF HIGH RESOLUTION MASS SPECTRAL DATA,
Wisconsin Univ., Madison. Dept. of Chemistry.
R. M. Hilmer, and J. W. Taylor.
Analytical Chemistry, Vol 45, No 7, p 1031-1045, June 1973. 9 fig, 5 tab, 23 ref.

Descriptors: *Data processing, *Computer programs, *Mass spectometry, *Pollutant identification, Computers, Electronic equipment, Instrumentation.
Identifiers: Mass spectra.

Several important instrumental characteristics of an AEI-MS9 double focusing mass spectometer in the Nier-Johnson configuration are discussed which influence the choice of techniques for on-line data acquistion and numerical methodology for high resolution mass spectral data processing. The approach described yields an average error of less than 10 ppm in mass measurement, and peaks as small as 0.05 percent of the tallest peak are observed. Instrument vibration raises the average mass error. Values below 3 ppm are obtained from data where vibration isolation has been attempted. The time of execution of the data reduction is about 3-10 min on the Raytheon 706 computer, and about 15-60 sec per spectrum on the Univac 1108. The computing times depend on the number of multiplet peaks to be deconvoluted, the number of peaks in the spectrum, and the number of atoms allowed in the elemental formulas. (Little-Battelle)
W73-12874

POLYAROMATIC HYDROCARBONS IN HIGH-BOILING PETROLEUM DISTILLATES. ISOLATION BY GEL PERMEATION CHROMATOGRAPHY AND IDENTIFICATION BY FLUORESCENCE SPECTROMETRY,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
For primary bibliographic entry see Field 05A.
W73-12875

OPTIMUM PROCEDURE FOR THE DETERMINATION OF SELENIUM IN BIOLOGICAL SPECIMENS USING SE-77M NEUTRON ACTIVATION,
Veterans Administration Hospital, Omaha, Nebr.
For primary bibliographic entry see Field 05A.
W73-12876

TOTAL MERCURY ANALYSIS: REVIEW AND CRITIQUE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05A.
W73-12885

SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA,
Cham/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 05A.
W73-12886

ANALYTICAL REVIEWS 1973/APPLICATIONS.
For primary bibliographic entry see Field 05A.
W73-12930

DETERMINATION OF URANIUM IN URINE SPECIMENS FOLLOWING THEIR SEPARATION THROUGH ANION EXCHANGE, (BESTIMMUNG DES URANS IN URINPROBEN NACH DESSEN ABTRENNUNG DURCH ANIONENAUSTAUSCH),
Vienna Univ. (Austria). Analytisches Institut.
For primary bibliographic entry see Field 05A.
W73-12931

DETERMINATION OF AMMONIUM IN SOIL EXTRACTS AND WATER SAMPLES BY AN AMMONIA ELECTRODE,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-12939

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, OCTOBER, 1972,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05B.
W73-12945

SOURCES OF DATA FOR EVALUATION OF SELECTED GEOTHERMAL AREAS IN NORTHERN AND CENTRAL NEVADA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-12947

SOLUBLE SILICA AND FLUORIDE IN SOME SURFACE AND GROUND WATERS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
P. B. Deshpande, and B. V. Venkata Rao.
Mysore J Agric Sci, Vol 6, No 2, p 107-113, 1973.
Identifiers: *Fluorides, Ground (Water), *India (Mysore), *Silica, Surface waters.

The pH, electrical conductivity, soluble silica and soluble fluoride were studied in relation to the geologic nature of the area. Well waters were slightly acidic or neutral in reaction; well waters located in granite and granite-gneissic area had a high fluoride concentration. Soluble silica in most of the ground waters was more than 2.0 ppm, an indication the equilibration of waters with the 2-phase system of kaolinite-montmorillonite formed during the weathering of silicate minerals. Tank waters were characterized by low silica content due to precipitation of soluble silica with calcareous or ferruginous sediments over which the impounded waters traverse.--Copyright 1973, Biological Abstracts, Inc.
W73-12969

2L. Estuaries

A CAGE FOR EXPOSING AQUATIC ANIMALS TO BOTTOM SEDIMENTS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
P. T. Heitmuller, and D. R. Nimmo.
Prog Fish-Cult. Vol 34, No 2, p 120. 1972. Illus.
Identifiers: *Aquatic animals, *Bottom sediments (Estuarine), Cage, Sediments, *Shrimp, Estuaries, Organic pollutants.

A holding cage was constructed to assess uptake of organic pollutants from estuarine bottom sediments by penaeid shrimp in the field. The cage was a 2-tier redwood frame covered with hardware cloth and weighted to give it stability in tidal currents encountered in Escambia Bay, Florida. The design features a chamber where control animals are held above while experimental animals are in direct contact with the bottom sediments. Thirty 3-in. shrimp were successfully held in one of these cages for 3 wk.--Copyright 1972, Biological Abstracts, Inc.
W73-12372

A RECORD OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI) FEEDING ON JUVENILE CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA) IN A BRITISH COLUMBIA ESTUARY,
Far Seas Fisheries Research Lab., Shimizu (Japan).
J. Ito, and R. R. Parker.
J Fish Res Board Can. Vol 28, No 12, p 1921. 1972.
Identifiers: *Canada (British Columbia estuary), Chinook salmon, Clupea-harengus-Pallasi, Estuaries, *Feeding habits (Herring), Herring, Juveniles, Oncorhynchus-tshawytscha, *Pacific herring, Salmon, Predator-prey relationships.

An occurrence of C. harengus pallasi predation on juvenile O. tshawytscha is described. This is the first recorded incidence of this particular predator-prey relation.--Copyright 1972, Biological Abstracts, Inc.
W73-12375

CORRELATED LIGHT AND ELECTRON MICROSCOPE STUDIES ON BROWN ALGAE. II. PHYSODE PRODUCTION IN DICTYOTA,
Leeds Univ. (England). Dept. of Plant Sciences.
For primary bibliographic entry see Field 05C.
W73-12388

BIOLOGY OF ROCK CRAB (CANCER IRRORATUS) IN NORTHUMBERLAND STRAIT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. J. Scarratt, and R. Lowe.
J Fish Res Board Can. Vol 29, No 2, p 161-166. 1972. Illus.
Identifiers: Biology, Cancer-Irroratus, *Crabs, Mussels, *Canada (Northumberland Strait), Polychaetes, Populations, Prey, *Rock crab, Sea-Urchin, Starfish.

Divers hand-collected 342 C. irroratus ranging from 4.2 mm carapace width to 97 mm (females) and 127 mm (males). The sex ratio (1.37:1) was biased in favor of males. Of 2929 crabs taken in commercial lobster fishing gear, 92% were above the minimum commercial size of 89 mm, and of these 99.1% were male. Smallest size at maturity was 69 mm for females and 60 mm for males. Breeding occurred in late summer and fall. Larvae were present in surface waters from June to Sept. Pey of crabs >25 mm consisted principally of polychaetes, mussels, starfish, and sea urchins. Crabs less than about 65 mm inhabit rocky areas; larger crabs move out onto sand and mud. The

fishable population is probably not in significant competition with lobsters for food or space.–Copyright 1972, Biological Abstracts, Inc.
W73-12390

PROCEEDINGS OF SEMINAR ON EUTROPHICATION AND BIOSTIMULATION.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05C.
W73-12391

NUTRIENT CONTROL IN NORTH SAN FRANCISCO BAY,
Brown and Caldwell, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05C.
W73-12398

MATHEMATICAL MODELING OF PHYTOPLANKTON POPULATIONS,
Hydroscience, Inc., Westwood, N.J.
For primary bibliographic entry see Field 05C.
W73-12399

AGP STUDIES IN THE SAN FRANCISCO BAY--DELTA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 05C.
W73-12401

CHARACTERISTIC PHYSICAL AND BIOGENIC SEDIMENTARY STRUCTURES IN GEORGIA ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
J. D. Howard, and R. W. Frey.
American Association of Petroleum Geologists Bulletin, Vol 57, No 7, p 1169-1184, July 1973. 10 fig, 36 ref. NSF Grants GA-719 and GA-10888.

Descriptors: *Estuaries, *Georgia, *Sedimentary structures, Sand waves, Ripple marks, Sedimentology, Benthos, Sedimentation, Particle size, Sands, Silts, Mud, Gravels, Salt marshes.
Identifiers: *Bioturbation.

Estuaries of the Georgia coast contain a wide variety of sedimentary textures and physical and biogenic sedimentary structures. Sediment grain sizes range from fine mud to pebbles. Physical sedimentary structures include small- to large-scale sets of parallel-, ripple-, and cross-laminae. Biogenic structures include abundant burrows and bioturbations by many marine invertebrate organisms. Very fine-grained sediments tend to accumulate near the ocean, regardless of substantial sand sources far upstream. Pleistocene sand outcrops are very important locally, expecially near the ocean. Tests and shells generally are scarce. Ebb-current flow structures predominate over flood-current flow structures. Diversity and abundance of biogenic sedimentary structures decrease both landward and toward the deeper parts of estuarine channels. Muds generally contain distinct burrows, whereas sands may contain both discrete burrows and more general bioturbation. (Knapp-USGS)
W73-12410

LONG WAVE PROPAGATION IN IDEALIZED ESTUARY,
Birmingham Univ. (England). Dept. of Civil Engineering.
D. W. Knight.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9842, p 993-1007, July 1973. 13 fig, 3 ref, append.

Descriptors: *Estuaries, *Waves (Water), *Tides, *Seiches, Numerical analysis, Unsteady flow, Tidal waters, Model studies, Equations, Hydrodynamics.

An analytical solution is given for equations written by Proudman to describe motion in an idealized estuary. In the idealized estuary, the channel is horizontal, of constant rectangular section, closed at one end and open at the other to tidal influence. The motion is one-dimensional, and the solution includes the effects of both the convective acceleration and friction terms. The solutions are developed in terms of working expressions for the tidal elevation and velocity at any point in the estuary. The limitations of this second-order solution are given in graphical form, in terms of four dimensionless numbers. Finally, the solution is compared with that obtained by solving 'Telegraphers' equation, and Proudman's solution is found to be more satisfactory. (Knapp-USGS)
W73-12417

PROCESS-FORM VARIABILITY OF MULTICLASS COASTS: BAJA CALIFORNIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. D. Wright, H. H. Roberts, J. M. Coleman, R. L. Kupfer, and L. W. Bowden.
Available from NTIS, Springfield, Va. 22151 as AD-756 676 - Price $3.00 printed copy; $1.45 microfiche. Technical Report No 137, February 1973. 54 p, 19 fig, 22 photo, 2 tab, 31 ref.

Descriptors: *Coasts, *Geomorphology, *Land forming, *Mexico, *Pacific Ocean, Gulfs, Beaches, Littoral drift, Ocean waves, Ocean currents, Tidal effects, Waves (Water), Correlation analysis.
Identifiers: *Baja California (Mexico), *Gulf of California.

The coast of Baja California, Mexico, experiences two zonal process environments: the high-wave-energy Pacific coastal environment and the low-wave-energy, structure-dominated Gulf of California coastal environment. Both zones exhibit characteristic coastal landscapes reflecting the zonal environments. Along the Pacific coast a combination of high wave power, unidirectional littoral drift, and a series of right-lateral strike-slip faults parallel to the deepwater wave power results in extensive unbroken beaches and barrier-lagoon complexes alternating with rocky cliffs. Intrazonal variability is less pronounced along the Gulf of California coast. Because it is adjacent to a plate spreading center, this coast is tectonically juvenile, lacking a continental shelf and having precipitous offshore slopes. This situation, combined with the fact that waves are weak and variable in direction, has yielded a straight, cliffed coastline without long beaches. (Woodard-USGS)
W73-12422

OBSERVATIONS OF INTERMEDIATE AND SMALL SCALE TURBULENT WATER MOTION IN A STRATIFIED ESTUARY (PARTS I AND II),
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
R. C. Seitz.
Available from NTIS, Springfield, Va. 22151 as AD-756 252 - Price $3.00 printed copy; $1.45 microfiche. Technical Report 79, Reference 73-2, January 1973. 247 p, 24 fig, 13 tab, 83 ref, 2 append. NOAA N00014-67-A-0163-0006.

Descriptors: *Estuaries, *Turbulent flow, *Stratified flow, *Current meters, *Maryland, Tidal streams, Flow measurement, Density stratification, Instrumentation, Remote sensing.
Identifiers: *Patuxent estuary (Md), Doppler shift current meter.

In May 1967 a series of measurements of 3-dimensional convected turbulent flow (scales of motion ranging from greater than 100 meters to 0.1 meters) were made in the Patuxent estuary, Maryland, with a 3-axis doppler shift (acoustic) type of current meter. Experimental design, instrumentation doppler meter noise, hydrography, and a general theory for sampling of convected fields of turbulence are discussed. The study is also concerned with the general theory of 3-dimensional fields of turbulence in stratified estuaries and the results of extensive spectral and statistical calculations on five of the records of turbulence. The effects of the estuary boundary are shown in the low wave number anisotropy; spectrally local anisotropy induced by the field of stratified density in the estuary is also shown and quantitatively related to the amount of density stratification at the depth of observation. The likelihood of high wave-number isotropic turbulence is shown and the transition wave-number denoting its onset is emperically related to the local Richardson number of the flow. Five of the doppler meter records were computer filtered so that the characteristics of the high wave-number velocity field could be determined; noted amounts of patchiness or intermittency of the filtered records of velocity was observed. The flatness of the filtered velocity records increased rapidly as a function of the local Richardson number. The structure of the average 'patches' of turbulence together with other characteristics of the small-scale motion in the estuary is discussed in terms of the theory for shear instability. (Woodard-USGS)
W73-12424

THE COMPUTATION OF TIDES AND CURRENTS IN ESTUARIES AND CANALS,
Massachusetts Inst. of Tech., Cambridge. Hydrodynamics Lab.
D. R. F. Harlemen, and C. H. Lee.
Available from NTIS, Springfield, Va. 22151 as AD-756 136 - Price $3.00 printed copy; $1.45 microfiche. Army Corps of Engineers Committee on Tidal Hydraulics Technical Bulletin No 16, September 1969. 276 p, 105 fig, 5 tab, 43 ref, 3 append. ACE DA-22-079-civeng-66-17.

Descriptors: *Hydrologic aspects, *Estuaries, *Canals, *Tidal effects, Analytical techniques, Numerical analysis, Equations, Channel morphology, Saline water intrusion, Currents (Water), Runoff, Flow rates, Diurnal, Water level fluctuations, Tides, Tidal streams, Inland waterways, Computer programs.

The analysis of one-dimensional tidal motion is described in the two principal types of tidal waterways: (1) estuaries open to the ocean at one end and merging with a river at the opposite end; and (2) canals or waterways connecting two independent tidal bodies. The objectives were to classify tidal problems. The primary concern was with analytical and numerical methods rather than with analog and physical models. In general, only one-dimensional methods were considered since these are adequate for many practical problems. Tidal motion in a canal or estuary can be described by two equations, one expressing the conservation of mass (the continuity equation), and the other expressing the dynamic equation of motion in the longitudinal direction (the momentum equation). The various ways of dealing with these two equations are: (1) harmonic methods; (2) method of characteristics; and (3) finite difference methods. The nonlinear, finite difference method proved to be the most satisfactory for solution of one-dimensional tidal hydraulic problems. Seven case studies are given to demonstrate the versatility of the method in both prismatic and irregular channels, in closed and open end estuaries and sea level canals. The diagonal mesh computation method using an explicit scheme results in relatively simple computer programs and efficiency in computer time. Computer programs have been developed for closed end estuaries, open end estuaries, and sea level canals. (Woodard-USGS)
W73-12428

FINAL ENVIRONMENTAL STATEMENT: SMALL BEACH EROSION CONTROL PROJECT, BROADKILL BEACH, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 08B.

W73-12430

CLASSIFICATION OF COASTAL ENVIRONMENTS, PROCEDURES AND GUIDELINES,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, and B. P. Hayden.
Available from NTIS, Springfield, Va 22151 as AD-757-798 Price $3.00 printed copy; $1.45 microfiche. Technical Report No 2, February 1973. 41 p, 2 fig, 6 tab, 21 ref. ONR N00014-69-A-0060-0006.

Descriptors: *Coasts, *Geomorphology, *Classification, Climate, Air masses, Land forming, Environment, Environmental effects, Sediment transport, Beach erosion, Littoral drift, Geology.

Considerable work in the analysis and classification of coasts from a geologic or geomorphologic perspective has been reported. The best information available is descriptive, and it was decided that those descriptive attributes which reflect and are responsive to ongoing processes form a solid base for the classification of coastal interfaces. Three attribute classes of the coastal interface were found to be reflective of ongoing interface processes: gross form of the coastal interface; chemical composition of the coastal interface; and size character of interface materials. All coastal interfaces have each of these three attributes and differ only in specifics. Some coastal interfaces have two attributes such as sand and rock material sizes in a specific configuration as in a coast of pocket beaches or sand beaches with rock headlands. In these cases both characters are included in the classification. In total, 15 classes of interfaces were found. (Woodard-USGS)
W73-12433

DELAWARE ESTUARY, PENNSYLVANIA, NEW JERSEY, AND DELAWARE, LONG--RANGE DREDGED SPOIL DISPOSAL PROBLEM.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 05E.
W73-12560

ESTUARINE NAVIGATION PROJECTS.
Committee on Tidal Hydraulics (Army), Washington, D.C.
For primary bibliographic entry see Field 08B.
W73-12575

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 2. NORTH JETTY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12581

FORECASTING STORM-INDUCED BEACH CHANGES ALONG VIRGINIA'S OCEAN COAST,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 04A.
W73-12584

SEA FLOOR OFF MAGDALENA DELTA AND SANTA MARTA AREA, COLOMBIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02J.
W73-12591

COMPUTER MODELS OF DELTA GROWTH DUE TO SEDIMENT INPUT FROM RIVERS AND LONGSHORE TRANSPORT,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.

W73-12592

LONG-LIVED POLLUTANTS IN SEDIMENTS FROM THE LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12595

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05A.
W73-12601

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 05B.
W73-12606

THE ZOOPLANKTON OF THE GULF OF GUINEA,
For primary bibliographic entry see Field 05A.
W73-12623

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 05A.
W73-12629

THE EFFECT OF FLOODWATER ON OYSTERS IN MOBILE BAY,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05C.
W73-12658

BACTERIA OF MUDS COLONIZED BY SPARTINA TOWNSENDII AND THEIR POSSIBLE ROLE IN SPARTINA DIE-BACK,
Commonwealth Mycological Inst., Kew (England).
A. Sivanesan, and J. G. Manners.
Plant Soil. Vol 36, No 2, p 349-361, 1972. Illus.
Identifiers: *Bacteria, *Muds, *Spartina-M dieback, Spartina-Townsendii-M, *England (Lymington estuary), Estuaries.

A study of the bacterial microflora of muds colonized by Spartina townsendii agg. in healthy and 'die-back' sites in the Lymington estuary was made. No important qualitative differences were found between the microfloras of the 2 types of site. Fewer species, however, were present in the die-back sites. It is suggested that under anaerobic conditions, such as occur in a 'die-back' site, the bacteria will utilize such oxygen as is present, and will then engage in anaerobic metabolic processes, producing reduced ions which will reduce the oxidation-reduction potential still further. The occurrence of abundant sulfate reducers in the 'die-back' sites may be particularly significant in this respect. No evidence was obtained of any more direct relationship between bacterial flora and the development of 'die-back'.--Copyright 1972, Biological Abstracts, Inc.
W73-12705

LIPIDS IN SHALLOW BOTTOM SEDIMENTS,
Harvard Univ., Cambridge, Mass. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-12717

PREDICTION OF UNSTEADY SALINITY INTRUSION IN ESTUARIES: MATHEMATICAL MODEL AND USER'S MANUAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
M. L. Thatcher, and D. R. F. Harleman.
Available from NTIS, Springfield, Va 22151 as COM-73-10543 Price $3.00 printed copy; $1.45 microfiche. Massachusetts Institute of Technology Sea Grant Project Office Report No MITSG 72-21, November 30, 1972. 117 p, 11 fig, 7 tab, 5 ref, 3 append. NOAA Sea Grants GH-88 and 2-35150.

Descriptors: *Saline water intrusion, *Estuaries, *Mathematical models, *Computer programs, Input-output analysis, Tidal effects, Streamflow, Discharge (Water), Water levels, Forecasting, Systems analysis, Programming languages, Methodology.
Identifiers: FORTRAN programming.

A computer program is presented for the implementation of the mathematical model for the prediction of unsteady salinity intrusion in estuaries. The model is one-dimensional, although varying degrees of stratification are accounted for in the assumed longitudinal dispersion relationship. The purpose of this manual is to enable researchers and engineers to use the computer program in an effective manner without requiring that they have other than a fundamental understanding of how digital computers accept input data, execute logical and numerical instructions, and present calculations in readable form. Although a knowledge of FORTRAN programming is helpful, it is not considered necessary for the prospective user of this program. However, to avoid unnecessary computing expense, it is recommended that a user not familiar with computer applications seek the assistance of someone who is experienced when it comes to the actual execution of the computer program. (See also W73-06183 and W73-10112) (Woodard-USGS)
W73-12728

BIOGEOCHEMISTRY OF SEDIMENTS OF DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
F. M. Swain.
Available from NTIS, Springfield, Va 22151 as COM-73-10415 Price $3.00 printed copy; $1.45 cents microfiche. DEL-SG-8-72, December 1972. 44 p, 3 fig, 20 tab, 5 ref. NOAA Sea Grant 2-35223.

Descriptors: *Sedimentology, *Bays, *Delaware River, *Biochemistry, *Geochemistry, Sediments, Chemical analysis, Sampling, Data collections, Organic matter, Ecology, Ecosystems, Benthos, Environmental effects, Dredging, Sedimentation.
Identifiers: *Delaware Bay.

Surface Holocene sediment samples from middle Delaware Bay and cored Holocene samples from lower Delaware Bay were studied for general sediment characteristics, pH, Eh, organic carbon, hydrogen, carbohydrates, amino acids, hydrocarbons, chlorophyll-derived pigments, carotenoid pigments, and humic acids. Samples from a core near Wilmington Canyon on the continental slope off Delaware Bay were analyzed for organic carbon, hydrogen, and total carbohydrates. The middle bay sediments of fine sands, silts, and clays are locally reducing and contain moderate amounts of organic residues. The middle bay is to some extent a settling area for organic matter, but a great deal of the suspended organic matter bypasses to the open sea. The lower bay sediments of sands and silty and clayey sands are possessed of a more generally oxidizing environment and contain, in most instances, less organic matter than the middle bay. The lower bay appears to be primarily a bypassing rather than a settling area for organic matter. The analytical data are tabulated. (Woodard-USGS)
W73-12739

HISTORY OF SEDIMENTATION IN MONTSWEAG BAY,
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.
D. Schnitker.
Maine Geological Survey Bulletin No 25 (Contribution No 43 from I.C. Darling Center, Maine University), 1972. 20 p, 19 fig, 3 ref.

Descriptors: *Estuaries, *Maine, *Sedimentation, Provenance, Tides, Sampling, Sounding, Seismic studies, Swamps, Sediment transport, Tidal waters.
Identifiers: *Montsweag Bay (Maine).

Montsweag Bay at the central Maine coast is a deeply excavated bedrock valley that has largely been filled by sediments. The deeper portions of the bedrock valley are filled by a Pleistocene blue clay which is disconformably overlain by thick Holocene sediments. Sediments were dated by radiocarbon and pollen analyses. Sedimentation rates for the last 250 years varied between 1.15 and 1.9 cm per year, increasing towards the present. These figures compare with observed sedimentation rates of 1.9 to 2.8 cm per year. The sediment accumulating in Montsweag Bay can be entirely accounted for by the influx of suspended matter with each tidal cycle through the southern entrance to the bay. Montsweag Bay is near its terminal stage of becoming a salt marsh. (Knapp-USGS)
W73-12740

FUNGI COLONIZING WOOD SUBMERGED IN THE MEDWAY ESTUARY,
Aberdeen Univ. (Scotland). School of Agriculture.
N. J. Poole, and P. C. Price.
Trans Br Mycol Soc. Vol 59, No 2, p 333-335, 1972.
Identifiers: Ceriosporopsis-halima, *Chlorinity, *Estuaries, Fagus-sylvatica, *Fungi, Nitrogen, Phoma-sp, *Scotland (Medway Estuary), Solids, Suspended solids, Wood wastes, Zalerion-maritima.

A list of fungi found to colonize beech (Fagus sylvatica) blocks placed in the upper estuary at Townsend Paper Mills, Snodland, England, and the lower estuary at H. M. Dockyard, Chatham (Scotland), is presented with data on chlorinity, N concentration as ammonium and nitrate, and suspended solids. The species lists were different, Ceriosporopsis halima, Phoma sp., and Zalerion maritima being the only species of seventeen found to occur at both stations.--Copyright 1973, Biological Abstracts, Inc.
W73-12825

COMMUNITY STRUCTURE OF THE BENTHOS IN SCOTTISH SEA-LOCHS. II. SPATIAL PATTERN,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 05C.
W73-12855

SIMULATION STUDY OF PHYTOPLANKTON PHOTOSYNTHESIS AND GROWTH IN THE FRASER RIVER ESTUARY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-12919

MERCURY DISTRIBUTION IN ESTUARINE--NEARSHORE ENVIRONMENT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05B.
W73-12920

THE PHYSIOGNOMY AND STRUCTURE OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND (SEILI ISLANDS),
Turku Univ. (Finland) Dept. of Botany.
For primary bibliographic entry see Field 05A.
W73-12929

TRACE ELEMENT TRAPPING IN PTEROPOD TESTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-12937

A HYDROGRAPHIC ATLAS OF LARGER NORTH CAROLINA SOUNDS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
A. B. Williams, G. S. Posner, W. J. Woods, and E. E. Deubler, Jr.
Available from NTIS, Springfield, Va. 22151 as COM-73-10454, Price $3.00 printed copy; $1.45 microfiche. North Carolina University Sea Grant Program Publication UNC-SG-73-02, January 1973. 130 p, 50 fig, 76 tab, 7 ref. NOAA Sea Grant 2-35178.

Descriptors: *Water temperatures, *Salinity, *Sounds, *North Carolina, Data collections, Estuaries, Coasts, Reviews, Maps, Isotherms, Sampling, Sites, Geomorphology.
Identifiers: Isohalines.

An atlas of figures, tables, and a short text provides a summary of salinity-temperature data for inland coastal waters of North Carolina in files of the University of North Carolina Institute of Marine Sciences. Mean monthly surface and bottom isohalines and isotherms are depicted in a series of 48 figures. Monthly means and extremes for salinity-temperature values are listed in tables for 76 fixed stations. During the past 75 years various portions of sounds and tidal rivers of North Carolina have been surveyed hydrographically as special interests required. Major hydrographic features and data collection sites are shown on maps. (Woodard-USGS)
W73-12948

CLASSIFICATION OF THE COASTAL ENVIRONMENTS OF THE WORLD: PART II. AFRICA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. Hayden, M. Vincent, D. Resio, C. Biscoe, Jr., and R. Dolan.
Available from NTIS, Springfield, Va. 22151 as AD 759-052 Price $3.00 printed copy; $1.45 microfiche. Technical Report No 3, February 1973. 46 p, 12 fig, 11 tab, 39 ref. ONR Contract Nonr-N00014-69-A-00060-0006.

Descriptors: *Coasts, *Environmental effects, *Classification, *Africa, Climates, Vegetation, Waves (Water), Shores, Geomorphology, Topography, Beaches, Littoral drift, Sands, Particle size, Beach erosion, Currents (Water), Ocean currents, Correlation analysis, Marine geology.
Identifiers: *Coastal environments.

As defined in this classification, the coastal environment has two common attributes: (1) a fluid environment consisting of both atmospheric and marine components, and (2) an interacting coastal interface system. Each attribute was classified independently prior to the integration of the components into the Classification of the Coastal Environments of the World, Part II: Africa. The atmospheric environment was treated using the methodology of air mass climatology, and the marine system was classified using water-mass analysis with modifications appropriate to nearshore conditions. The classification of shoreline interfaces was developed by detailed analysis of coastal landforms. Coastal vegetation was analyzed and distributions were compared with the physical components of the system. Close agreement was found between the biotic and physical environments, which served to verify the methodology employed. The existence of both north-south and east-west hemispheric symmetry at all levels accounts for the high degree of internal coupling among the processes operative within the coastal zone. The similarities and differences between the coastal environments of Africa and those found in the earlier study of the Americas are discussed and causal factors explored. (Woodard-USGS)
W73-12950

MARICULTURE IN ESTUARINE OIL--PIPELINE CANALS IN LOUISIANA,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12951

STANDING CROPS OF NATURAL FISH POPULATIONS IN BRACKISH-WATER OIL FIELD PIPELINE CANALS,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12952

INVESTIGATION OF THE NATURE, EXTENT AND FATE OF NATURAL OIL SEEPAGE OFF SOUTHERN CALIFORNIA,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 05B.
W73-12958

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HIGH-PURITY DISTILLED WATER PRODUCING APPARATUS,
Toshin Industrial Machine Co. Ltd., Osaka (Japan). (assignee)
S. Miyamoto.
U. S. Patent No. 3,736,234, 6 p, 7 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1665, May 29, 1973.

Descriptors: *Patents, *Distillation, *Water purification, *Water treatment, Equipment, *Condensation, Vapor, Evaporation.

The apparatus comprises a mist separator mounted in a steam generator, and a tubular section for introducing steam into a condenser. The upper portion of the tube is adapted to heat exchange steam with liquid condensed at substantially high temperature and collected near the upper portion. There is at least one liquid receiving section arranged within the condenser for receiving a required amount of the liquid and at least one gas removing container in which occluded gas is continuously evacuated by gas aspiration. (Sinha-OEIS)
W73-12450

HEAT-EXCHANGER FOR DESALTING SEA WATER,
Societa Italiana Resine S.P.A., Milan (Italy). (assignee)
D. Barba, G. Liuzzo, G. Tagliaferri, and A. Germana.

U.S. Patent No. 3,735,808, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1562, May 29, 1973.

Descriptors: *Patents, *Desalination apparatus, *Sea water, Saline water, Equipment, *Heat exchangers, Evaporation, *Condensation, Potable water, Water treatment.

The object is an improvement relating to instantaneous multiple expansion evaporators. A nest of tubes is rendered rigid with a hollow cylinder which is passed through a single hole provided in the separating baffle so that a high degree of tightness is achieved between the cylinder and the hole. Each tube of the nest is located in apertures predisposed in the circular walls of the cylinder, and therefore rendered rigid with the cylinder itself. Sea water is preheated before being introduced into the chambers by causing it to pass as cooling liquid through heat-exchanger tubes. The vapor formed condenses on nests of heat exchanger tubes which longitudinally traverse the entire length of the evaporator and the condensate is collected so that it cannot come in contact with the saline solution. (Sinha-OEIS)
W73-12453

ION EXCHANGE COLOR AND MINERAL REMOVAL FROM KRAFT BLEACH WASTES,
Montana State Univ., Bozeman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-12522

3B. Water Yield Improvement

A COMPARISON OF RATES OF WATER LOSS THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 02D.
W73-12497

THE INTERRELATIONSHIPS OF THE VEGETATION CHARACTERS OF FOUR SALT DESERT SHRUB ASSOCIATIONS OF COLORADO PLATEAU,
Pakistan Forest Inst., Peshawar.
K. M. Ibrahim, and D. L. Goodwin.
Pakistan Journal of Forestry, Vol 21, No 2, p 121-132, April 1971. 5 tab, 11 refs.

Descriptors: *Desert plants, *Correlation analysis, *Shrubs, Colorado, Plant populations, Range grasses, Arid lands, Range management, Watershed management, Planning, Livestock, Sediments, Reclamation, Colorado River.
Identifiers: *Colorado Plateau, *Saltbush.

In planning range and watershed management of the Colorado Plateau region, four distinct salt desert shrub associations were identified and studied: Atriplex confertifolia -- Hilaria jamesii; Atriplex nuttallii var. nuttallii; Atriplex nuttallii var. gardneri -- Aster xylorrhiza; and Atriplex corrugata. Simple correlation coefficients, used to show the interrelationships between the vegetation characters of the plant communities, indicate: (1) In the Atriplex confertifolia -- Hilaria jamesii association, an increase in shrub cover might reduce the perennial grass cover; (2) in the Atriplex nuttallii var. nuttallii -- Hilaria jamesii association, an increase of shrub cover probably will reduce the cover of perennial grasses and annuals; (3) in the Atriplex nuttallii var. gardneri -- Aster xylorrhiza association, the presence of shrubs may decrease the cover of annuals; and (4) in the Atriplex corrugata association, an increase of shrub cover would affect adversely the cover of perennial grasses, annuals, and cryptogams. The study is of particular importance for this arid region, not only because this is a major wintering area for livestock, but also because the Colorado Plateau region produces considerable unwanted sediment which affects reclamation developments on the Colorado River. (Gloyd-Arizona)
W73-12791

SOME EFFECTS OF EVAPORATION SUPPRESSION ON RESERVOIR ECOLOGY,
North Texas State Univ., Denton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-12869

3C. Use of Water of Impaired Quality

MINERAL POLLUTION IN THE COLORADO RIVER BASIN,
Environmental Protection Agency, Phoenix, Ariz. Colorado River Basin Water Quality Control Project.
For primary bibliographic entry see Field 05B.
W73-12715

LEACHING SALTY SOILS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 02G.
W73-12789

SODIUM RELATIONS IN DESERT PLANTS: 1. CATION CONTENTS OF SOME PLANT SPECIES FROM THE MOJAVE AND GREAT BASIN DESERTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 02I.
W73-12792

SODIUM RELATIONS IN DESERT PLANTS: 2. DISTRIBUTION OF CATIONS IN PLANT PARTS OF THREE DIFFERENT SPECIES OF ATRIPLEX,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 02I.
W73-12793

EFFECT OF QUALITY OF WELL WATERS ON THE GERMINATION AND MINERAL COMPOSITION OF WHEAT ON SALINE-SODIC SOILS RICH IN MAGNESIUM,
Banaras Hindu Univ., Varanasi (India). Dept. of Soil Science and Agricultural Chemistry.
S. Singh, and R. S. Singh.
J Indian Soc Soil Sci. Vol 19, No 4, p 383-388. 1971.
Identifiers: Germination, *India (Bihar), *Magnesium, Minerals, *Saline sodic soils, *Wheat-M, Well water.

Some important characteristics of salt-affected well waters and their impact on the germination and chemical composition of wheat on saline-sodic soils rich in Mg in south western tracts of Bihar were studied. Most of the well waters contain more soluble Mg than Ca. The concentration of Na, CO3 and HCO3 is also very high. The characteristics of well waters like electrical conductivity, Na adsorption ratio, soluble Na percentage, and residual Na carbonate are significantly correlated (negatively) with germination percentage. The correlation between soluble Ca percentage and germination percentage is positively correlated. Positive correlations exist between soluble Na percentage of water and Na of plants. Na+Mg/Ca of irrigation water is positively (significantly) correlated with Na and Mg. A prediction value (Na+Mg/Ca) has been evolved for judging the quality of well waters on the basis of adverse effect of Na and Mg and favorable effect of Ca on the germination. The predicted value is highly correlated (negatively) with germination percentage.--Copyright 1972, Biological Abstracts, Inc.
W73-12809

MORPHOLOGY, GENESIS, OCCURRENCE AND AGRICULTURAL POTENTIAL OF ACID SULPHATE SOILS IN CENTRAL THAILAND,
Food and Agriculture Organization of the United Nations, Bangkok (Thailand). Soil Survey Land Classification Project.
For primary bibliographic entry see Field 02G.
W73-12818

3D. Conservation in Domestic and Municipal Use

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W73-12351

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-12354

ANNUAL REPORT OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION, 1972.
New York State Urban Development Corp., New York.

1972. 112 P, 16 FIG, PHOTO, 11 TAB.

Descriptors: *Floods, *Flood damage, *Urban renewal, *Chemung River, Planning, Flood control, Flood protection, *New York.
Identifiers: *Urban Development Corporation, *Hurricane Agnes, Chemung Valley, Temporary housing, Housing, Elmira (New York), Corning (New York).

The Urban Development Corporation, a state agency created by the New York legislature in 1968 to develop and finance low and middle income housing, to assist industrial and commercial development, and to help provide various civic facilities, works closely with local officials and citizen groups and attempts to be a catalyst for private development. The UDC's programs for 1972 are described. UDC response to the worst flooding in history in the Chemung Valley in late June, 1972, largely as a result of Hurricane Agnes, is discussed. Flood waters crested 12 feet higher than the protective dikes and levees and the cities of Elmira and Corning plus several small towns were devastated. Flood control measures are being studied to avoid reoccurrences of '72 disasters. Raising of dikes, dredging of Chemung River and construction of two Pennsylvania upstream dams is expected to substantially safeguard the entire Valley from future major flooding. The UDC played a key role in the federal mobile home program for temporary housing and immediately began working with the communities on urban renewal plans and programs. The urgency of the situation and the ability of UDC to act quickly have resulted in several completed plans and construction starts. (Elfers - North Carolina)
W73-12356

REGIONAL SEWER SYSTEM, PLANNING AND COST ESTIMATION MODEL,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 05G.
W73-12357

COMPREHENSIVE PUBLIC WATER SUPPLY STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.

Prepared for the Schenectady County Board of Representatives. Summary report. March 1970. 18 p, 3 maps, 7 tab. N.Y. State Dept. of Health CPWS-56.

Descriptors: *Water supply, *Planning, Administration, Financing, Water demands, Water rates, *New York, *City planning.
Identifiers: *Schenectady (New York), Water supply system expansion, Systems consolidation.

Since Schenectady County has adequate water supplies for the near future, planning is discussed for the orderly development and distribution of these supplies including the expansion and consolidation of existing systems to meet new demands efficiently. Focusing on the Schenectady Metropolitan Area and the Delanson-Duanesburg area, the study includes projections of population and water demands, inventories of existing systems and available water supply sources, examination of local water quality problems, and analyses of alternative development and expansion plans. It is recommended that all the public water systems in the Schenectady area be consolidated into a single system and that immediate steps be taken to increase and improve local supplies in the Delanson-Duanesburg areas. A proposed financing plan, including a new water rate schedule, and a plan for implementation, are outlined. (Elfers - North Carolina)
W73-12358

SUMMARY REPORT: COMPREHENSIVE SEWERAGE STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 05G.
W73-12359

OUTDOOR RECREATION IN THE BALTIMORE AREA.
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06D.
W73-12360

AN EVALUATION OF BALTIMORE HARBOR LAND USE POTENTIALS,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06B.
W73-12361

INTERIM AREAWIDE WATER AND SEWER PLAN: BEL-O-MAR AREA.
Candeub, Fleissig and Associates, Newark, N.J.
For primary bibliographic entry see Field 05G.
W73-12362

SURVEY OF WATER TRANSPORTATION POTENTIAL TO REDUCE CONGESTION AND POLLUTION IN WASHINGTON, D.C. AND OTHER MAJOR CITIES.
Lulejian and Associates, Inc., Falls Church, Va.
For primary bibliographic entry see Field 05G.
W73-12363

KAY COUNTY, OKLAHOMA, WATER AND SEWERAGE COMPREHENSIVE PLAN.
Evans and Nelson Engineering Co. and Associates, Ponca City, Okla.
For primary bibliographic entry see Field 05G.
W73-12364

FUNCTIONAL WATER AND SEWERAGE PLAN AND PROGRAM, PEE DEE REGION, SOUTH CAROLINA.
LBC and W Associates, Columbia, S.C.
For primary bibliographic entry see Field 05G.
W73-12365

TOWN OF CAIRO WASTE WATER REPORT.
Diachishn (A.) and Associates, New York.
For primary bibliographic entry see Field 05D.
W73-12366

THE LAKEFRONT PLAN OF CHICAGO.
Chicago, Ill.
For primary bibliographic entry see Field 04C.
W73-12367

REGIONAL UTILITIES STUDY: DRAINAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 04A.
W73-12368

REGIONAL UTILITIES STUDY: SEWERAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 05D.
W73-12369

COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12508

MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12509

EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12510

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 05G.
W73-12518

3E. Conservation in Industry

METHODS FOR THE FURTHER IMPROVEMENT OF SPENT LIQUOR RECOVERY IN LENZING,
Lenzinger Zellulose- und Papierfabrik A.G. (Austria).
For primary bibliographic entry see Field 05D.
W73-12524

ENVIRONMENTAL CARE AT PULP MILLS, RESULTS AND EXPECTATIONS,
National Swedish Environment Protection Board, Stockholm. Environmental Care Project.
For primary bibliographic entry see Field 05D.
W73-12545

VOLATILE BIOCHEMICAL OXYGEN-CONSUMING MATERIALS OCCURRING IN THE SULFITE PROCESS WITH LIQUOR NEUTRALIZATION AND CONDENSATE RECOVERY: THEORETICAL STUDY, (FLYKTIGA BIOKEMISK SYREFORBRUKANDE AMNENS UPPTRADANDE I SULFITPROCESSEN VID LUTNEUTRALISERING OCH KONDENSATATERFORING, TEORETISK UNDERSOKNING),
Angpanneforeningen, Stockholm (Sweden).
For primary bibliographic entry see Field 05D.
W73-12546

ADVANCED POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 05D.
W73-12552

ENVIRONMENTAL COST OF MINING,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12687

EXTERNALITIES, WELFARE, AND THE FEASIBILITY OF CORRECTIVE TAXES,
State Univ. of New York, Stony Brook.
For primary bibliographic entry see Field 06B.
W73-12694

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART I - EXECUTIVE SUMMARY.
For primary bibliographic entry see Field 05G.
W73-12707

IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART I. THE IMPACT OF ENVIRONMENTAL CONTROL COSTS.
Sobotka (Stephen) and Co., New York.
For primary bibliographic entry see Field 05G.
W73-12708

A DESCRIPTIVE ANALYSIS OF THE BAKERY PRODUCTS INDUSTRY DETAILING INDUSTRY TRENDS AND CHARACTERISTICS RELEVANT TO ECONOMIC IMPACT ANALYSIS OF ENVIRONMENTAL STANDARDS. PART II.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12709

A STUDY OF THE IMPACT OF POLLUTION STANDARDS AND CHARGES ON THE BAKERY INDUSTRY. PART III.
Ernst and Ernst, Washington D.C.
For primary bibliographic entry see Field 05G.
W73-12710

PETROLEUM...40 YEARS OF RESEARCH,
Secony Mobil Oil Co., Inc., New York.
D. H. Clewell.

Industrial Water Engineering, Vol 3, No 1, p 20, 21, 61, 62, January 1966.

Descriptors: *Pollution, Waste water disposal, *Waste water treatment, *Oil industry, Education, Professional societies, Universities, Recycling.

The petroleum industry has been working on various phases of water conservation for nearly 40 years. In 1927 after an American Petroleum Institute (API) study indicated the growing seriousness of public water supply pollution, the Institute formed a committee to collect, develop, and publish needed technical information on the disposal of refinery wastes. Over the intervening years the API has sponsored many research projects at universities and independent research institutions; several of the current projects are discussed. Most water pollution problems can be traced to society's expanding wants and needs and no segment can be singled out as the source of pollution problems, therefore water problems must be solved in a spirit of cooperation. (Campbell-NWWA)
W73-12768

AN INDUSTRIAL POINT OF VIEW-1970,
Wisconsin Electric Power Co., Milwaukee.
For primary bibliographic entry see Field 06B.
W73-12965

3F. Conservation in Agriculture

AQUEOUS IRON-SULFUR SYSTEMS IN RICE FIELD SOILS OF LOUISIANA,
Alabama Univ., Birmingham. Inst. of Dental Research.
G. Pitts, A. I. Allam, and J. P. Hollis.
Plant Soil. Vol 36, No 2, p 251-260. 1972. Illus.
Identifiers: Aqueous solutions, *Louisiana, *Rice-M fields, Soils, Sulfur, *Iron-sulfur solutions.

A phase diagram of an aqueous Fe-S system constructed from thermodynamic data for initial concentrations of 100 ppm H2S and 100 ppm Fe permitted the prediction that the principal precipitate found in the Eh-pH range of flooded Louisiana rice paddies would be FeS2. Analysis of precipitates formed in the laboratory at Eh and pH levels simulating paddy conditions showed that both FeS2 and FeS were present; however, more FeS than predicted was actually precipitated in the FeS2 field by dominance. A multiparameter diagram for an aqueous system was constructed relating equilibrium Fe concentration, Eh, pH and the equilibrium H2S concentration (that H2S which is in equilibrium with precipitated sulfides). It was demonstrated from the diagram and associated thermo-dynamic equations that the H2S±FeS2 equilibrium predicts theoretical values of H2S in agreement with experimental values of H2S from rice paddy soil samples.--Copyright 1972, Biological Abstracts, Inc.
W73-12385

CONSUMPTIVE USE OF WATER BY DWARF WHEAT IN UDAIPUR VALLEY,
Udaipur Univ. (India). Coll. of Agriculture.
S. P. Srivastava.
Indian J Agric Sci. Vol 42, No 2, p 152-155. 1972.
Identifiers: Ammonium, *Consumptive use, Evapotranspiration, India (Udaipur Valley), Nitrates, Sulfates, Transpiration, Triticum-Aestivum, Water utilization, *Wheat (Dwarf).

An irrigation-and-manurial trial with wheat (Triticum aestivum L.) cultivar 'S 227' was conducted on mixed black soil. The mean total consumptive use was 395 and 519 ha-mm, corresponding to 30 and 60% available soil moisture regime. The mean daily consumptive use was 0.6 ha-mm up to the first irrigation; thereafter, it increased by about 5 times. The evapotranspiration was also estimated from meteorological data through empirical formulae. Application of half of the N at sowing and the remaining half at crown-root-initiation stage proved better. Ammonium sulfate nitrate seemed to be a promising form of N.--Copyright 1973, Biological Abstracts, Inc.
W73-12387

A PILOT FISH-POND SYSTEM FOR UTILIZATION OF SEWAGE EFFLUENTS, HUMBOLDT BAY, NORTHERN CALIFORNIA,
California State Univ., Humboldt, Arcata.
For primary bibliographic entry see Field 05D.
W73-12434

FIELD LEACHING BY SPRINKLER AND SURFACE IRRIGATION DURING A CROP SEASON,
Agricultural Research Service, Brawley, Calif.
L. F. Hermsmeier, and M. T. Kaddah.
Paper 72-723, 1972 Winter Meet Am Soc Agric Eng, Chicago, Illinois, Dec 1972. 20 p, 4 fig, 3 tab.

Descriptors: *Leaching, *Irrigation, *Sprinkler irrigation, *Surface irrigation, *Salt balance, Drainage, Irrigation effects, Application methods, Subsurface drainage, Soil management, Irrigation efficiency, Crop production, Barley, Salinity, Saline soils, *California, On-site tests, Land reclamation, Rates of Application.
Identifiers: *Imperial Valley (Calif.), Salt removal.

Several major disadvantages of leaching a field by ponding water led to considering sprinklers as an alternative. Laboratory tests indicated that leaching by sprinkler irrigation may not only provide more efficient water use, but also save time, since when soil is not saturated, simultaneous leaching and crop production can occur. In Imperial Valley, California, a field experiment was conducted to determine: (1) the relative leaching effectiveness of sprinkling and surface irrigation on barley, and (2) effects of ponding on crop growth and yield. Results of leaching during 2 barley growing seasons indicated that applying excess irrigation water to a winter barley crop can effectively leach salt from the soil, while obtaining high crop yield. Salt removal improved slightly between drains in the top foot of soil when sprinklers were used, but no improvement was noted at a depth of 5 ft. Surface irrigation resulted in increased leaching and gave higher barley yields than sprinkler irrigation. Application of up to 30% excess water with surface irrigation and 67% excess water with sprinklers did not adversely affect yields. (USBR).
W73-12464

GENERALIZED DISCHARGE RELATIONS FOR CUTTHROAT FLUMES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 08B.
W73-12474

ELECTROSTATIC CROP SPRAYING,
Hong Kong Univ.
R. Coffee.
New Scientist, Vol 57, No 830, p 194-196, Jan 25, 1973. 2 fig, 1 photo.

Descriptors: *Pesticides, Pesticide drift, *Spraying, Pest control, Insect control, Environmental effects, Electric fields, Insecticides, Biology, Foreign research, Agricultural chemicals, Agriculture, Crops, Application methods, Pesticide kinetics, Agronomy, Water pollution control.
Identifiers: Spray losses, Hong Kong, Experimentation, *Charged particles, *Dusting, Electrostatic precipitation, *Electrostatics.

Investigations to improve methods of pesticide deposition, reduce the volume of pesticide applied, and lessen the drift problem are reported. One method described uses powerful electrostatic forces to propel and direct pesticide particles onto crop foliage, with a resulting increase in material efficiency, distribution, and retentivity. The basic principles of electrostatic deposition are not complicated. Particles to be deposited are given a unipolar charge as they leave of the vegetation being sprayed. Investigations reveal that even the underside of the leaves is covered with the pesticide. This technique may help solve the pollution problem by enabling more economical material to be used and by introducing a powerful magnetic settling field. The Electrical Engineering Department of Hong Kong University is studying the fundamentals of electrostatic crop spraying and developing 2 promising spraying devices. (USBR)
W73-12482

IMPROVEMENTS IN MOVING SPRINKLER IRRIGATION SYSTEMS FOR CONSERVATION OF WATER,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. L. Miles.
Available from the National Technical Information Service as PB-222 267, $3.00 in paper copy, $1.45 in microfiche. Colorado Environmental Resources Center Completion Report Series No. 49, June 1973. 153 p, 41 fig, 12 tab, 53 ref. OWRR-B-039-COLO (7). 14-31-0001-3064.

Descriptors: *Sprinkler irrigation, *Infiltration, *Irrigation systems, Irrigation design, Irrigation practices, Infiltration rates, Mathematical models, *Infiltrometers, Soil surfaces.
Identifiers: *Center-pivot sprinkler.

Self-propelled center-pivot sprinkler systems have become very popular because of their low labor requirements and ability to economically irrigate rolling sandhills. This equipment applies water uniformly to the soil surface, but the water application rates greatly exceed the infiltration capability of most soils causing water to move on the soil surface from local high areas and slopes to nearby low spots. The resulting nonuniformity of irrigation results in reduced crop yields, waste of water, and fertilizer leaching. This problem was investigated using a laboratory infiltrometer, a mathematical model, a field sprinkler infiltrometer, and field investigations under operating systems. Recommendations were developed to reduce of eliminate the problem through improved system design, special field preparation and farming techniques, and improved operating procedures.
W73-12507

COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12508

MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12509

INFLUENCE OF DIFFERENT MOISTURE REGIMES AND METHODS OF PHOSPHATE APPLICATION ON GROWTH AND NUTRIENT ABSORPTION BY WHEAT (TRITICUM AESTIVUM L.),
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
R. B. Sharma, G. P. Verma, and S. S. Khanna.
Indian J Agric Sci. Vol 42, No 1, p 52-56. 1972.

Identifiers: *Nutrient absorption (Plants), *Phosphates, TriticumaAestivum, *Wheat growth, Soil moisture.

The total dry matter and grain yield significantly increased with an increase in the level of soil moisture and by subsurface phosphate placement. However, the interaction between moisture levels and P placement was not significant. A decrease in the supply of soil moisture increased the N and K in the grain but decreased them in the straw. The concentration of P in the grain and straw decreased with a decrease in moisture supply. The placement of P had hardly any definite effect on the concentration of N and K in the grain and straw, but there was an increase in the concentration of P, though it was not statistically significant.--Copyright 1973, Biological Abstracts, Inc.
W73-12539

EFFECT OF VARYING WATER MANAGEMENT PRACTICES ON THE GROWTH, YIELD AND NITROGEN UPTAKE BY HIGH-YIELDING RICE VARIETIES,
Indian Agricultural Research Inst., New Delhi. Div. of Biochemistry.
J. E. Shinde, and V. K. Srivastava.
Indian J Agric Sci. Vol 42, No 1, p 57-62. 1972.
Identifiers: Cultivars, Plant growth, *Nitrogen fertilization, Oryza-Sativa, *Rice, Uptake, Water uptake, Yield, Water management (Applied).

The pot-culture experiment with rice (Oryza sativa L.) cv. 'IR 8' and cv. 'Padma' included waterlogging and upland conditions imposed during different growth stages of the plant. The effects of varying water management practices were fully expressed only when the plants were adequately fertilized with N. The highest grain yield and N uptake by the panicle was obtained in 'IR 8' and 'Padma' when waterlogging continued from transplanting to flowering and maximum tillering, respectively. Upland conditions imposed during any growth stage, except ripening, adversely affected the grain yield of 'IR 8', but 'Padma' withstood them better.--Copyright 1973, Biological Abstracts, Inc.
W73-12583

NUTRIENTS IN NEBRASKA'S WATERS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-12615

EFFECTS OF VARIOUS SOIL MOISTURE REGIMES AND DIFFERENT LEVELS OF NITROGEN AND DIFFERENT SPACINGS OF THE QUALITY OF POTATO TUBERS (SOLANUM TUBEROSUM L.),
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
R. S. Narang, and S. S. Kanwal.
J Res Punjab Agric Univ. Vol 8, No 4, p 432-436. 1971.
Identifiers: *Nitrogen, *Potato tubers, Protein, Soils, Solanum-Tuberosum, Spacings, Starch,Tubers, *Soil moisture.

The protein content in tubers increased with each level of available soil moisture (ASM) up to 20% ASM or N (up to 180 kg N/ha), whereas the starch content showed a reverse trend. The variation in spacing from 40 cm x 20 cm to 60 cm x 20 cm did not show any significant influence on either of these 2 quality characteristics. An inverse relationship was observed between the percentage of protein and starch contents of the tubers. The per hectare starch yield, however, was the highest at the highest level of N (180 kg N/ha), as well as at the highest available soil moisture regime (80%). This was because of the overall increased yield of tubers under these treatments. The treatment differences, however, were statistically non-significant.--Copyright 1973,Biological Abstracts, Inc.
W73-12640

THE QUALITY OF DRAINAGE WATER FROM IRRIGATED BLACK COTTON SOILS FOR IRRIGATION,
University of Agricultural Sciences, Siruguppa (India). Agricultural Research Station.
T. G. Bhadrapur, and T. Rao.
Mysore J Agric Sci. Vol 6, No 1, p 28-33. 1972.
Identifiers: Alkalinity, *Drainage water, Evaporation, *Irrigation, Salinity, Soils, Summer, Transpiration, Seepage, *Black cotton soils.

The Thungabhadra Project canal, its drainage and seepage waters were analyzed periodically for 1 yr to assess their suitability for irrigation. Both waters had high salt levels insummer months, seepage water is used for heavy irrigation with adequate drainage facilities; otherwise there is risk from both salinity and alkalinity hazards.--Copyright 1973, Biological Abstracts, Inc.
W73-12650

VARIABILITY OF RAINFALL AND AGRICULTURAL EFFICIENCY OF SHOLAPUR DISTRICT,
Sholapur Coll. (India). Dept. of Geography.
T. P. Patil.
J Shivaji Univ. Vol 4, No 7/8, p 101-107. 1971. Illus.
Identifiers: Agriculture, *India (Sholapur), Jowar, *Rainfall.

District Sholapur a semiarid part of Maharashtra receives scanty and varying amount of rainfall. Year round high temperature accounts for high water deficiency. Irrigation is insignificant, hence almost all crops are rainfed. Rains early, late and widely distributed result in changing crop pattern and acreage. Mean annual rainfall figures do not reflect the reliability of rainfall at a place, because they represent the mean of widely scattered figures on either side of the mean. Reliability is tested by coefficient of variability. A sound correlation exists between variability of rainfall and variability of gross cropped acreage. Similar relation is likely to exist between variability of rainfall and 'Rubi' jowar acreage.--Copyright 1973, Biological Abstracts, Inc.
W73-12659

EFFECT OF COMPACTION ON YIELD AND UPTAKE OF N, P AND K BY MAIZE (ZEA MAYS L.),
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
G. P. Verma, and R. B. Sharma.
JNKVV (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 6, No 1, p 16-20. 1972. Illus.
Identifiers: Bulk, Compaction, Density, *Maize, *Nitrogen, *Phosphorous, *Potassium, Yield, Zea-Mays.

Studies were conducted on 4 soil series of Malwa Plateau, Malwa Plateau, Madhya Pradesh. In the Kheri series, loosening the soil to a bulk density was useful whereas compaction considerably reduced the growth and absorption of nutrients. For the Kamaliakheri and Runija soil series, the natural bulk density was the optimum for maize whereas for the Unhel soil series, compaction of the soil to a bulk density of 1.40 g cm-3 increased the growth and absorption of nutrients. The compaction of soil to create a bulk density > 1.40 g cm-3 proved harmful for plant growth in all soil series. The harmful effect of compaction seemed to be due to reduction in the absorption of nutrients.--Copyright 1973, Biological Abstracts, Inc.
W73-12660

ANNUAL WATER BALANCE AND AGRICULTURAL DEVELOPMENT IN ALASKA,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
J. E. Newman, and C. I. Branton.
Ecology. Vol 53, No 3, p 513-519. 1972. Illus.
Identifiers: Agricultural development, *Alaska, Annual, *Crop production.

Mean annual precipitation in Alaska varies from 10 cm in the north to well over 500 cm in the southeast. Much of the interior has a macro-scale negative mean water balance, whereas coastal areas are very humid. Most land areas with the potential for agricultural development lie along the major interior river valleys. Nearly all of these land areas have long-term negative water balances. Should agricultural development take place in these areas, this negative water balance is likely to be magnified. Only those potential agricultural lands in the Kenai Peninsula, Kodiak-Aleutian Island chain, and the southeast coastal regions lack water limitations when subjected to intensive crop production.--Copyright 1973, Biological Abstracts, Inc.
W73-12664

SOIL NITROGEN BALANCE IN SELECTED ROW-CROP SITES IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science.
D. C. Adriano, F. H. Takatori, P. F. Pratt, and O. A. Lorenz.
J Environ Qual. Vol 1, No 3, p 279-283. 1972. Illus.
Identifiers: *California, Crop sites, Denitrification, Drainage, *Fertilization, Irrigation, Nitrate, *Nitrogen, Soils, Row crops.

Nine row-crop sites, where data for N fertilizer use, crop yields, and amounts of irrigation water used were available for a number of years, were studied to estimate the N balance as related to NO3- in water in the unsaturated zone from below the zone of root influence to the water table or to the 15-m depth. The system of predicting NO3- concentrations in drainage waters based on the difference between N inputs and N removal in harvested crops and the drainage volume in which the excess N, converted to NO3-, is dissolved, was valid in open-porous soils containing no layers that restrict water movement within the soil profile (0- to 2-m depth). A combination of losses plus net immobilization of up to 56% had to be assumed in some soils to account for all the N loss. In 2 soils that had been used for disposal of feedlot manure, net mineralization of N from the organic N pool had to be assumed to explain the data obtained. The current fertilization and irrigation practices used for some row crops in southern California leave varying amounts of NO3- in the drainage water. The amounts depend on the total N added, crop removal, drainage volume, net mineralization and losses.--Copyright 1973, Biological Abstracts, Inc.
W73-12670

ECONOMICS IN SOIL AND WATER CONSERVATION,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Iowa Agriculture and Home Economics Experiment Station, Ames, Journal Paper No. J-6470, 1972. 3 p. OWRR A-036-IA (6).

Descriptors: *Soil conservation, *Water conservation, *Economic efficiency, Project planning, Decision making, Productivity, Benefits.
Identifiers: Marginal analysis, Multipurpose activities, Externalities.

Protection of the soil and water resource base to maintain high agricultural productivity requires selection of type and amount of public resources to be used for resource management and investment and choice of soil and water practices on the basis of cost-benefit criteria. Using simple graphical analysis a method is illustrated for determining the amount of investment required to maintain a chosen productivity level and the success of past conservation investments. Selection of conservation practices should be based upon marginal analysis. It is important that this same analysis be applied to the selection of a multipurpose activity. Thus, investments in each of the various purposes will be determined to maximize the return to each

purpose. Despite the economic logic behind the use of marginal analysis in investment decisions, Federal flood control legislation requires only that benefits exceed costs. Watershed, basin and district organizations attempt to internalize the externalities associated with conservation practices. (Weaver-Wisconsin)
W73-12691

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
For primary bibliographic entry see Field 04B.
W73-12698

COST CURVES FOR CROSS-DRAINAGE WORKS,
Government Coll. of Engineering, Aurangabad (India).
For primary bibliographic entry see Field 04A.
W73-12704

HYDROPHYSICAL PROPERTIES AND WATER REGIME OF CRIMEAN SOUTHERN CHERNOZEMS IN A FIELD CROP ROTATION (VODNO-FIZICHESKIYE SVOYSTVA I VODNYY REZHIM YUZHNYKH CHERNOZEMOV KRYMA V POLEVOM SEVOOBOROTE),
Krymskii Selskokhozyaistvennyi Institut, Simferopol (USSR).
For primary bibliographic entry see Field 02G.
W73-12744

WATER REGIME IN A CROP ROTATION ON CHERNOZEM SOILS IN SOUTHEAST RUSSIA (VODNYY REZHIM V SEVOOBOROTE NA CHERNOZEMNYKH POCHVAKH YUGO--VOSTOKA),
For primary bibliographic entry see Field 02G.
W73-12747

WATER METABOLISM IN DESERT SHEEP, EFFECTS OF VARIOUS DEGREES OF WATER RESTRICTION ON THE DISTRIBUTION OF BODY WATER IN MARIWARI SHEEP,
Central Arid Zone Research Inst., Jodhpur (India). Div. of Animal Studies.
F. R. Purohit, P. K. Ghosh, and G. C. Taneja.
Australian Journal of Agricultural Research, Vol 23, No 4, p 685-691, July 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Animal metabolisms, *Water requirements, *Dehydration, *Animal physiology, *Drought tolerance, Sheep, Arid lands, Deserts, Livestock, Water shortage, Water utilization, Drought resistance, Adaptation, Weight.
Identifiers: *India (Rajasthan), Water deprivation, Body fluids, Mariwari breed.

The most crucial limiting factor for the survival of livestock in the arid and semiarid tracts of western Rajasthan in northwest India is the chronic scarcity of drinking water. During critical periods many stock growers try to save their flocks by transhumance, but mostly the animals must depend on their physiological ability to withstand water deprivation. Effects of various degrees of water restriction on the distribution of body water in Mariwari sheep, one of the hardiest breeds in the Rajasthan desert, are discussed. These sheep are able to withstand a dehydration loss of about 18 percent in body weight, evidence that they are reasonably well adapted to water deprivation. When the water intake was reduced below 75 percent of the normal daily requirement, the total body water, total blood and plasma values, and the extracellular, intracellular, and interstitial fluid volumes of the sheep began to decrease. A reduction to 25 percent normal intake was similar in its effect to complete deprivation, with plasma volume falling by 43 percent and the extracellular fluid volume by 33 percent. However, the animals do not have the ability to maintain an expanded plasma volume against general dehydration. (Gloyd-Arizona)
W73-12788

EFFECT OF LEVEL OF SOIL MOISTURE ON NITROGEN MINERALIZATION AND NITRIFICATION DURING INCUBATION OF EAST PAKISTAN TEA SOILS,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
M. Ishaque, and A. H. Cornfield.
Bangladesh J Biol Agric Sci. Vol 1, No 1, p 52-58. 1972.
Identifiers: *East Pakistan, Incubation, Microbial activity, Mineralization, *Nitrification, Nitrogen, Soils, Tea soils, *Soil moisture.

The effects of varying static moisture contents (20-100% maximum water holding capacity, mwhc) on levels of mineral-N (NH4- and NO3-N) during incubation at 30C for 2, 5 and 12 wk of low flat (LF) and high flat (HF) tea soils (pH 4.1 and 4.2) were studied. The optimum moisture content for mineral-N accumulation after 12 wk was 40% mwhc for the LF soil and 100% mwhc for the HF soil. During 5 wk of incubation the HF soil generally accumulated more mineral-N than did the LF soil at all moisture contents. After 12 wk of incubation there was a little difference in mineral-N accumulation at 20-60% mwhc between the 2 soils, but at 80-100% mwhc accumulation was considerably higher in the HF soil. There was small nitrate accumulation in the LF soil at the lower moisture contents but only with up to 5 wk of incubation. In the HF soil there was fair accumulation of nitrate at all moisture contents.--Copyright 1973, Biological Abstracts, Inc.
W73-12799

SIGNIFICANCE OF HEATING AGRICULTURAL SOILS,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
G. K. Viswanath, and S. C. Pillai.
Indian J Agric Sci. Vol 42, No 1, p 75-80. 1972. Illus.
Identifiers: Aeration, Agriculture, Ammonium sulfate, Crop yields, *Heating soil, Phosphates, Soils, Sulfate, *Water reuse, *Soil treatment.

The formation and stabilization of water-stable aggregates under the influence of temperature in soils treated with different amounts of water, sewage, other forms of organic matter and inorganic fertilizers were studied. At higher temperatures attained in soils, either naturally or artificially, the total percentage of water-stable aggregates increased. Treatment of soils with (NH4)2SO4 and superphosphate and subsequent drying at 103C not only increased the water-stable aggregates to the maximum extent but also transformed all of them into aggregates larger than 2 mm in diameter. The increase in the water-stable aggregates and consequent improvement of aeration of the heated soils are the main reasons for getting higher crop yields.--Copyright 1973, Biological Abstracts, Inc.
W73-12802

DIURNAL AND SEASONAL EFFECTS OF ENVIRONMENT ON PLANT WATER RELATIONS AND FRUIT DIAMETER OF CITRUS,
New York State Coll. of Agriculture, Ithaca. Dept. of Pomology.
D. C. Elfving, and M. R. Kaufmann.
J Am Soc Hortic Sci. Vol 97, No 5, p 566-570. 1972. Illus.
Identifiers: *Citrus, Diurnal, Moisture, Permeability, Pressure, Roots, Seasonal, Shrinkage, Soils, Temperature, Vapor, *Soil water, *Leaf water potential.

Leaf water potential of 'Valencia' orange trees was influenced by soil water availability, soil temperature (T) and vapor pressure deficit (VPD) of the atmosphere. Low soil water availability prevented full nighttime recovery from water stress. Soil T below 15C decreased root permeability for water absorption and contributed to low daytime water potentials (high water stress), but at night when transpiration was minimal, complete recovery occurred. VPD effects on leaf water potential were also most noticeable during the day. Stage II fruits exhibited a recurring diurnal size change during daylight hours. This reversible shrinkage was correlated with simultaneous changes in fruit and leaf water potential and fruit diffusion resistance. However, the irreversible nighttime growth rate could not be correlated with day or night water potentials of air T, or with night VPD. While differences between fruit and leaf water potentials occurred, no evidence permits an unequivocal statement that transpiring fruits can behave as a midday reservoir of water for leaves.--Copyright 1973, Biological Abstracts, Inc.
W73-12805

PROTEIN CONTENT OF BROWN RICE BY UPLAND POLYETHYLENE FILM MULCHING CULTURE, (IN JAPANESE),
H. Taira, H. Taira, and F. Furusawa.
Proc Crop Sci Soc Jap. Vol 41, No 2, p 160-165. 1972. (English summary).
Identifiers: *Mulch, Polyethylene film, *Protein, *Rice (Brown).

The upland mulching culture had a higher protein content in lowland brown rice as compared with the lowland culture. The average increasing index, (upland mulching culture/lowland culture) x 100, of the nonglutinous and glutinous types was 120.6% and 122.6%. The upland mulching culture also gave higher protein content in lowland and lowland-upland hybrid brown rice as compared with the upland culture on the same manuring condition. The average increasing index, i.e., (upland mulching culture/upland culture) x 100, is as follows: lowland brown rice: non-glutinous type 106.0% and glutinous type 107.6%; lowland-upland hybrid brown rice: non-glutinous type 106.9% and glutinous type 107.2%.--Copyright 1973, Biological Abstracts, Inc.
W73-12806

REUSE OF HUMAN WASTES IN AGRICULTURE,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 05D.
W73-12817

ECOLOGICAL INFORMATION ON THE DIFFERENCES IN THE NUMBER OF CULEX TRITAENIORHYNCHUS LARVAE AMONG PADDY FIELDS (IN JAPANESE),
Osaka Prefecture Inst. of Public Health (Japan).
H. Nakamura, M. Yoshida, S. Ito, and K. Tonomura.
Jap J Sanit Zool. Vol 22, No 3, p 176-181, 1971, Illus. English summary.
Identifiers: Culex-tritaeniorhynchus, Density, Ecological studies, Food, *Japan, Larvae, *Paddy fields, Pupa, Seasonal, *Mosquitos.

The seasonal fluctuation of the density of larvae and pupae of C. tritaeniorhynchus in paddy fields was investigated at Sijyonawate-cho (Japan), 1968-1969. The number of larvae and pupae varied seasonally at each paddy field. In some paddy fields, the number of larvae and pupae tended to be maintained at relatively high levels. In other paddy fields, the number of larvae and pupae was always smaller than the average. The number of first and second instar larvae tended to be larger in the paddy fields in which the density of larvae was always high than in the ones in which the density was low. Water samples were taken from the paddy fields to check the survival rate of the first

instar larvae in the laboratory at 30C, 16 hr illumination. Survival rate was higher in the water from the paddy fields where larvae were abundant. Higher survival rate was observed in the water taken from the paddy field at certain seasons when the number of larvae was high. However, when 0.1 g of artificial food per pot was added to the water from paddy fields in which the density of larvae was low, the survival rate increased. This suggests that the low value in the survival rate in water from some paddy fields may be attributed to the deficiency of food.--Copyright 1973, Biological Abstracts, Inc.
W73-12829

AQUALCULUTRE: THE FARMING AND HUSBANDRY OF FRESHWATER AND MARINE ORGANISMS,
J. E. Bardach, J. H. Ryther, and W. O. McLarney.
Wiley-Interscience, a division of John Wiley and Sons, Inc.: New York, N.Y., U.S.A.; London, England. 1972. Pr.$37.50. 868p, Illus, Map.
Identifiers: Animals, *Aquaculture, Books, Farming, *Fresh water organisms, Husbandry, *Marine organisms, Plants.

A world-wide species by species illustrated description is provided of all aquatic plants and animals that are cultivated for food and the methods by which this is accomplished. Biological and ecological considerations of the organisms, the current and projected state-of-the-art of their cultivation, and yields, diseases and other problems are discussed. General principles and economics are dealt with in the first chapter. Whereever possible, data concerning yields, economics, lists of food organisms, nutritional requirements, and other pertinent topics are presented in tabular form. A total of 43 chapters are included on the culturing of various groups of freshwater and marine organisms. An appendix, pond siting and construction, provides technical information on pond culture in general. The book ends with an index of names of animals and plants, and an index of persons, places and institutions of interest to investigators interested in aquaculture.--Copyright 1973, Biological Abstracts, Inc.
W73-12830

EFFECT OF SOIL MOISTURE ON THE GROWTH OF MACROPHOMINA PHASEOLI, SCLEROTIUM ROLFSII AND FAUSARIUM SOLANI IN SOIL,
Jute Agricultural Research Inst., Barrackpore (India).
T. P. Mustafee, and S. B. Chattopadhyay.
Indian J Microbiol. Vol 11, No 4, p 77-82. 1971.
Identifiers: Fusarium-Solani, Growth, Macrophomina phaseoli, Sclerotium rolfsii, *Soil moisture, *Fungi.

Experiments were conducted at soil moisture levels of 20, 40, 60 and 80% saturation. The 40% saturation level was most effective for F. solani; at 80%, steady decline occurred. For M. phaseoli, 60% was favorable; at 20%, it showed an unfavorable reaction. A steady decline in S. rolfsii population was noted at all levels of saturation, especially at 80%; the fungus could not be detected 20 days after inoculation of the soil.--Copyright 1973, Biological Abstracts, Inc.
W73-12831

THE EFFECT OF IRRIGATION DEPTH ON ROOT GROWTH OF SOME PASTURE SPECIES,
Melbourne Univ., Parkville (Australia). Dept. of Agricultural Engineering.
P. W. Cullen, A. K. Turner, and J. H. Wilson.
Plant Soil. Vol 37, No 2, p 345-352. 1972. Illus.
Identifiers: Depth, Growth, Irrigation, Lolium-Perenne, Pasture species, *Root depth, Trifolium-Repens, Trifolium-Subterraneum, *Root growth.

Within the limits of the experiment, 60 cm, the depth of rooting of 3 pasture species in a sandy loam soil was found to be directly affected by the depth to which irrigation water penetrated the soil. Some practical implications for irrigation farming are discussed. The species reacted differently to the deeper wetting treatments; white clover (Trifolium repens) produced a larger weight of roots, subterranean clover (T. subterraneum) a lesser weight, and there was no difference in the weight of roots with perennial ryegrass (Lolium perenne). However, the weight of roots relative to the total weight of the plant decreased with increase in the wetting depth in all 3 species. The effect of the growth of roots on the total growth of the plants is discussed and it is suggested that root growth is not a determinate of total production when the supply of nutrients is not limiting. The vertical distribution of the roots is discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-12834

GERMINATION OF WHEAT AS AFFECTED BY SOIL WATER STRESS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
M. C. Pawloski, and C. F. Shaykewich.
Can J Plant Sci. Vol 52, No 4, p 619-623. 1972. Illus.
Identifiers: *Hydraulic conductivity, Membranes, *Soil-water stress, *Wheat germination.

Germination rate of wheat was determined at several water potentials (-0.8, -5.3, -7.8, and -15.3 bars) on 2 soils and a semi-permeable membrane. Germination rate decreased as matric potential decreased. At a given water potential, germination rates were the same for both soils but germination on the membrane system was faster than on soils. Hydraulic conductivity was different on the 2 media, indicating that the hydraulic conductivity is an important component of soil water stress. Germination rate was not affected by decreasing water potential to -7.8 bars on each medium. At the -15.3-bar potential germination rate was considerably slower.--Copyright 1973, Biological Abstracts, Inc.
W73-12884

EFFECT OF ENVIRONMENTAL FACTORS ON WATER UTILIZATION AND BORON ACCUMULATION AND TRANSLOCATION IN SUGARCANE,
Hawaii Agricultural Experiment Station, Honolulu.
J. E. Bowen.
Plant Cell Physiol, Vol 13, No 4, p 703-714, 1972.
Identifiers: *Boron, Environmental effects, Humidity, Light *Sugarcane, Temperature, Translocation, Transpirant, Water utilization, Crop yield.

Rates of Boron (B) accumulation and/or water utilization of 3 mo.-old sugarcane plants were altered by changes in temperature, relative humidity, light intensity and duration of exposure to light. The effects of the environment on B accumulation were not directly dependent upon effects on water utilization. B accumulation was affected more than water uptake by increasing root and air temperatures from 8 deg C-37 deg C, and by raising the pH of the external solution from 5.7-7.0. Contrarily, water utilization decreased more than B accumulation when the relative humidity was increased from 30 plus or minus 5% - 95 plus or minus 5%, when light intensity was decreased or daily exposure to light was shortened and when the plants were pretreated with 5 x 10 0.00001 M phenylmercuric acetate, an anti-transpirant. The absorption of B by roots was experimentally separated from its subsequent translocation to the shoots. Absorption of B by roots was at least partially under metabolic control, since uptake from a 2 mg/l B solution could occur against a concentration gradient. Translocation of B from the roots to the shoot occurred passively in the transpiration stream.--Copyright 1973, Biological Abstracts, Inc.
W73-12966

INFLUENCE OF CERTAIN ROTATIONS UPON COTTON PRODUCTION IN THE SAN JOAQUIN VALLEY,
Agricultural Research Service, Shafter, Calif. Cotton Research Station.
J. H. Turner, E. G. Smith, R. H. Garber, W. A. Williams, and H. Yamada.
Agron J. Vol 64, No 4, p 543-546. 1972.
Identifiers: *Crop production, Alfalfa, Corn, *Cotton, Gossypium hirsutum D, Infiltration, Medicago sativa D, *Rotations, *San Joaquin Valley, Verticillium, Wilt, Zea mays M, Fertilization.

Cotton (Gossypium hirsutum L.) is the major cash commodity from San Joaquin Valley farms. Frequently, growers plant cotton for 3-6 yr without rotation. Alfalfa for hay production or grain crops planted on land removed from cotton. Very few rotation studies with cotton have been conducted in the western states. The purpose of this experiment was to determine the effect of certain rotations and N applications on growth and yield of cotton. Increased yields were obtained for cotton following alfalfa (Medicago sativa L.) and cotton following corn (Zea mays L.) over the continuous cotton plots. No advantage for yield was shown between cotton following corn and cotton following alfalfa. N fertilization increased yields of continuous cotton, of cotton following corn, and of cotton the second yr following alfalfa, but not of cotton the first yr after alfalfa. Water infiltration data showed that a significant reduction of water intake occurred on the N subplots compared to those with no N. Plant heights were significantly different at first-bloom stage for both the rotation and the N treatments. Final plant height at maturity, however, was seldom influenced by rotation treatment. The N treatment producted taller plants in most years. Verticillium wilt was more prevalent in the continuous cotton than in the cotton following other crops. Wilt was also more prevalent on the N-fertilized subplots. Growing continuous cotton lowered the yields, hindered early season growth, and increased Verticillium wilt. N fertilization reduced infiltration rate of water, which is an important consideration to farm managers in this area.--Copyright 1972, Biological Abstracts, Inc.
W73-12975

EFFECTS OF WATER STRESS ON NITROGEN--FIXING ROOT NODULES: IV. EFFECTS ON WHOLE PLANTS OF VICIA FABA AND GLYCINE MAX,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
J. L. Sprent.
New Phytol. Vol 71, No 4, p 603-611. 1972. Illus.
Identifiers: Glycine-max, *Nitrogen, Photosynthesis, *Root nodules, Soil, *Soybeans, Tritiated water, Vicia-faba.

Water stress reduced N fixation of soybean plants grown in the pots of sand. Provided that the nodules retained some activity, recovery on watering was normally complete in an hour. Using tritiated water (3HOH) it was confirmed that water could be withdrawn by nodules en route from the root to the shoot system. A field trial with V. faba showed a high degree of correlation between soil-water content and N-fixing activity. Slow natural drying over a 6-wk period resulted in progressive reduction of activity, which was restored by irrigation. Maximum N fixation occurred at about field capacity; above this, activity was reduced due to waterlogging. Under the conditions of the experiment, water supply was the major environmental factor affecting N fixation. It is suggested that water stress affects nodule activity directly, but that this effect may be aggravated by reduced supplies of photosynthate from wilted leaves. (See also W73-02633),--Copyright 1973, Biological Abstracts, Inc.
W73-12977

EDAPHIC AND WATER RELATIONSHIPS OF ALDICARB AND ITS METABOLITES,
North Dakota State Univ., Fargo. Dept. of Entomology.
For primary bibliographic entry see Field 02G.
W73-12979

VIRUSES INFECTING PEACHES IN THE MURRUMBIDGEE IRRIGATION AREAS OF NEW SOUTH WALES,
New South Wales Dept. of Agriculture, Rydalmere (Australia). Biological and Chemical Research Inst.
R. D. Pares, L. J. Penrose, and P. F. Kable.
Aust J Exp Anim Husb. Vol 12, No 57, p 447-448. 1972.
Identifiers: *Australia, Irrigation, *Mottle virus, Murrumbidgee, Necrotic, New-South-Wales, *Peaches, Prunus, Ringspot, *Viruses.

Prunus necrotic ringspot and dark green sunken mottle viruses were present in canning peaches.--Copyright 1973, Biological Abstracts, Inc.
W73-12981

EVALUATION OF TENSIOMETERS FOR ESTIMATING PLANT WATER STRESS IN CITRUS,
New York State Coll. of Agriculture, Ithaca. Dept. of Pomology.
M. R. Kaufmann, and D. C. Elfving.
Hortscience. Vol 7, No 5, p 513-514. 1972. Illus.
Identifiers: *Citrus, Diffusion, Leaf, Matric, Soils, Temperature, *Tensiometers, Water stress, *Leaf-water potential.

Field measurements of leaf water potential were made on 'Valencia' orange trees subjected to varying degrees of soil water availability. During the night, leaf water potentials were reasonably well correlated with tensiometer estimates of soil matric potential. During the day, however, leaf water potentials were unrelated to matric potential because plant water balance was influenced by other factors in the shoot and root environments, including vapor pressure deficit, leaf diffusion resistance, and soil temperature.--Copyright 1973, Biological Abstracts, Inc.
W73-12985

CONSUMPTIVE USE OF WATER BY COTTON GROWN IN TRANSITION TRACT OF DHARWAR UNDER RAINFED CONDITIONS,
College of Agriculture, Dharwar (India).
G. Hunsigi, G. K. Kulkarni, B. H. Katarki, and D. M. Amernath.
Mysore J Agric Sci. Vol 6, No 1, p 38-42. 1972. Illus.
Identifiers: *Consumptive use, *Cotton, Equations, Evaporation, *India (Dharwar), Rainfed conditions, Regression, Transition.

The Blaney and Criddle formula predicts more favorably the actual consumptive use of cotton then Lowry and Johnson's. A highly significant correlation was observed between the open pan evaporation (Eo) and the consumptive use (Cu) obtained by the 2 empirical methods. Linear regression equations are drawn between Eo and Cu.--Copyright 1973, Biological Abstracts, Inc.
W73-12988

CHARACTERIZATION OF EXUDATION FROM EXCISED ROOTS OF ONION, ALLIUM CEPA: I. WATER FLUX,
Liverpool Univ. (England). Dept. of Botany.
R. K. M. Hay, and W. P. Anderson.
J Exp Bot. Vol 23, No 76, p 577-584. 1972. Illus.
Identifiers: Allium-Cepa, *Exudation, Flux, *Onion roots, Hydraulic conductivity.

Measurements of the rates of fluid exudation from excised roots of onion, and determinations of the osmolalities of the exudate fluids are found to be adequately related by the simplest model in which the rate of fluid exudation is proportional to the osmotic pressure difference between the exudate fluid and the bathing solution. The mean hydraulic conductivity of roots produced by unsprouted onion bulbs is 0.44 x 0.000001 cm s-1 atm-1 and of roots from sprouted bulbs is 0.91 x 0.000001 cm s-1 atm-1.--Copyright 1973, Biological Abstracts, Inc.
W73-12989

ANTITRANSPIRANT FILM: CURTAILING INTAKE OF EXTERNAL WATER BY CHERRY FRUIT TO REDUCE CRACKING,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02D.
W73-12992

ANTITRANSPIRANTS FOR CONSERVATION OF LEAF WATER POTENTIAL OF TRANSPLANTED CITRUS TREES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02D.
W73-12993

INFLUENCE OF WATER POTENTIAL ON GROWTH, ANTIBIOTIC PRODUCTION AND SURVIVAL OF CEPHALOSPORIUM GRAMINEUM,
Washington State Univ., Pullman. Dept. of Plant Pathology.
For primary bibliographic entry see Field 05B.
W73-12999

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

ANNUAL REPORT OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION, 1972.
New York State Urban Development Corp., New York.
For primary bibliographic entry see Field 03D.
W73-12356

REGIONAL UTILITIES STUDY: DRAINAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.

Prepared for Capitol Region Planning Agency, Hartford, Conn., 1969. 97 p, 8 fig, 23 tab, 44 ref, glossary. UPA: Conn. P-78 (G).

Descriptors: *Drainage, *Watersheds, *Drainage programs, Flood flow, Flood data, Land use, Flood protection, Non-structural alternatives, Projections, Planning, *Connecticut, Regional analysis, Regional development.
Identifiers: Hartford (Conn), Capitol Region (Conn), Bigwood-Thomas Flood Flow Formula.

Detailed background data related to drainage and used to formulate plans and programs presented in the Technical Report on the Regional Utilities Study is given in outline form and working tables. Illustrating the planning methods and approaches used to formulate the final plans, the data and planning outlines fall under several categories: (1) background data such as population and land use plus descriptions of data collection procedures and approaches for evaluating alternatives; (2) drainage data such as flood control structures, flood records, climate, gaging stations, and areas of watersheds; (3) drainage plan elements including proposed open space areas, channel improvements, flood plain zoning, and encroachment lines; (4) numerous tables of data relating to the watersheds, their drainage basin areas and flows; and (5) flood flow determination procedures by use of Bigwood-Thomas Formula and the Rational Formula. (Elfers - North Carolina)
W73-12368

THEORY OF PRECIPITATION EFFECTS ON DEAD CYLINDRICAL FUELS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02B.
W73-12381

SIXTEENTH ANNUAL ARIZONA WATERSHED SYMPOSIUM PROCEEDINGS.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 04D.
W73-12403

ANALYSIS OF SEEPAGE INTO GROUND--WATER SYSTEM,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W73-12412

PROBLEMS IN THE PRODUCTION OF A SPRING FLOOD (VOPROSY FORMIROVANIYA VESENNEGO POLOVOD'YA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 194, A. A. Sokolov, editor, Leningrad, 1972. 256 p.

Descriptors: *Floods, *Spring, *Soils, *Soil moisture, Soil properties, Water balance, Water storage, Precipitation (Atmospheric), Runoff, Evaporation, Recharge, Water loss, Water yield, Watersheds (Basins), Hydrographs, Snowmelt, Water equivalent, Forests, Grasslands, Forecasting, Snow surveys.
Identifiers: *USSR, Valday Field Laboratory, Don River, Nomograms.

Spring floods in forest-steppe and forested regions of European Russia were analyzed for improvement of current methods for forecasting and computing components of a flood hydrograph and snowmelt losses to water absorption and evaporation in a river basin. Factors producing the outstanding spring flood of 1970 on rivers in the Central Black Earth region are examined, and studies are made of soil moisture storage in the Don River basin, water properties of frozen soils, water equivalent of snow, spring-runoff losses to basin recharge, and problems related to evaluation and analysis of items in the water balance. Data used in preparation of this collection of 14 papers are based on laboratory and on-site investigations by the Leningrad State Hydrologic Institute and on observation data of a network of stations ofthe Hydrometeorological Service. (See W73-12436 thru W73-12444) (Josefson-USGS)
W73-12435

INVESTIGATION OF THERMAL PROPERTIES OF SOILS IN THE DON RIVER BASIN FOR ESTIMATION OF SNOWMELT LOSSES TO INFILTRATION INTO FROZEN SOIL (ISSLEDOVANIYE TEPLOVYKH SVOYSTV POCHV BASSEYNA R. DONA DLYA OTSENKI POTER' TALYKH VOD NA IN FIL'TRATSIYU V MERZLUYU POCHVU),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12436

LABORATORY INVESTIGATIONS OF THE TRANSMISSION CAPACITY OF FROZEN AND THAWED SOILS BASED ON DATA OF THE VALDAY FIELD LABORATORY (VNIGL) (LABORATORNYYE ISSLEDOVANIYA VODOPROPUSKNOY SPOSOBNOSTI MERZLYKH I TALYKH POCHVO-GRUNTOV (PO MATERIALAM MERZLOTHOY LABORATORII VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12437

PRINCIPLES FOR ESTIMATING AND FORECASTING WATER LOSSES IN SPRING ON WATERSHEDS IN NORTHWESTERN EUROPEAN USSR (PRINTSIPY OTSENKI I PROGNOZA POTER' VESENNIKH VOD NA VODOSBORAKH SEVERO-ZAPADA YETS),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12438

ESTIMATION AND FORECAST OF WATER LOSSES DURING A SPRING FLOOD TO GROUNDWATER RECHARGE FOR WATERSHEDS IN NORTHWESTERN EUROPEAN USSR BASED ON DATA OF THE VALDAY FIELD LABORATORY (OTSENKA I PROGNOZ POTER' VODY V PERIOD VESENNE GO POLOVOD'YA NA POPOLNENIYE ZAPASOV GRUNTOVYKH VOD DLYA VODOSBOROV SEVERO-ZAPADA YETS (PO MATERIALAM VNIGL)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-12439

FACTORS PRODUCING THE OUTSTANDING SPRING FLOOD OF 1970 IN UPPER DON RIVER BASINS (USLOVIYA FORMIROVANIYA VYDAYUSHCHEGOSYA VESENNEGO POLOVOD'YA 1970 G. V BASSEYNAKH REK VERKHNEGO DONA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-12440

RESULTS OF A STUDY OF WATER REGIME OF SOILS ON SMALL WATERSHEDS IN THE DON RIVER BASIN (REZUL'TATY IZUCHENIYA VODNOGO REZHIMA POCHV MALYKH VODOSBOROV V BASSEYNE R. DONA),
Gosudarstvenni Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12441

EVAPORATION DURING A FLOOD PERIOD CAUSED BY SPRING SNOWMELT (ISPARENIYE V PERIOD VESENNEGO SNEGOTAYANIYA I POLOVOD'YA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02D.
W73-12442

SOME HYDROPHYSICAL CHARACTERISTICS OF SOILS IN THE DON RIVER BASIN TO KAZANSKAYA STATION (NEKOTORYYE VODNO-FIZICHESKIYE KHARAKTERISTIKI POCHV BASSEYNA R. DONA DO ST-TSY KAZANSKOY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12443

METHODS OF DETERMINING SOIL MOISTURE STORAGE IN WINTER (K METODIKE OPREDELENIYA VLAGOZAPASOV POCHVY V ZIMNIY PERIOD GODA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W73-12444

THE MULTIPURPOSE DEVELOPMENT OF THE RIVER RHONE VALLEY,
Compagnie Nationale du Rhone, Lyon (France).
C. Gemaehling, and P. Savey.
Water Power, Vol 24, No 11, p 403-410, Nov 1972. 4 fig, 7 photo, 2 tab.

Descriptors: *River basin development, Water resources development, Economic impact, *Multiple purpose projects, Watershed management, Automatic control, Hydroelectric power, Bulb turbines, Navigable rivers, Navigation, Land development, Foreign projects, Planning, Management.
Identifiers: France, Rhone River (France), Hydroelectric resources, Locks (Waterways).

The Rhone River Valley is being developed by the Compagnie Nationale du Rhone (CNR) for navigation, hydroelectric power, and agricultural water. The development plan consists of a series of low-head stations spaced about 15 to 30 km apart. Each of the 21 stations planned consists of a dam, reservoir, branch canal, power station, and navigation locks. Presently, the project power stations contribute over 8% of the total electric power production in France. Vertical shaft Kaplan turbine units were used in the early plants, but increased economy has brought changes to bulb-type equipment and also to computerized automation of all the plants. By 1975, navigation locks should make navigation possible from the Mediterranean Sea to 250 km inland. For each development, the CNR cooperates with the Ministry of Agriculture to completely reorganize local agriculture. This complex development project tends to modernize and industrialize the area surrounding the Lyons-Marseilles axis. (USBR)
W73-12467

HEURISTIC RANKING AND PRIORITIZING UNDER SUBJECTIVE CONDUCTIONS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 06B.
W73-12470

HYDROLOGICAL RESERVOIR DESIGN USING BASIC SYSTEMS THEORY TECHNIQUES,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 08A.
W73-12471

RESERVOIR-YIELD ESTIMATION PROCEDURES,
British Columbia Univ., Vancouver.
C. S. Joy, and T. A. McMahon.
Inst Eng, Aust, Civ Eng Trans, Vol CE14, No 1, p 28-36, Apr 1972. 11 fig, 8 tab, 33 ref.

Descriptors: *Reservoir yield, *Reservoir storage, *Reservoir design, Forecasting, Stochastic processes, Low flow, Streamflow, Storage capacity, Hydrology, Probability, Mathematical models, Bibliographies, *Australia.
Identifiers: Foreign studies, Stochastic data simulation, *Reservoir capacity, Reservoirs, Mathematical analysis, Streamflow records.

Methods of determining reservoir storage capacity are critically reviewed and applied to 6 Australian rivers. The storage procedures are divided into critical period, stochastic, and data generation techniques. Procedures in critical period techniques are applicable only for preliminary design. Conclusions regarding this technique are: (1) Of the lowflow techniqes, Alexander's procedure is recommended. Equally acceptable are the monthly and annual behavioral techniques. (2) Discrepancies arise in the techniques of Stall and Thompson. (3) Hardison's technique tends to overestimate the required storage. The procedures of stochastic and data generation techniques are regarded as final design techniques. Conclusions regarding these techniques are: (1) the modified procedures of Gould were the most satisfactory, and (2) both of Moran's techniques neglect the time dependence of inflows. Results from 2 synthetic data generating models illustrate that a suitable model must satisfactorily preserve the characteristics of correlated seasonal flows that are highly skewed. Although the skewed seasonal model of Thomas and Burden gave adequate results for the Yarra River, the model was not applied to more highly skewed flows. Kartvelishvli's approach may be more satisfactory for highly skewed data. (USBR)
W73-12478

HYDROLOGIC MODELS FOR POORLY DEFINED DRAINAGE AREAS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 02A.
W73-12496

HERBICIDE CONTAMINATION OF SURFACE RUNOFF WATERS,
Utah State Univ., Logan. Dept. of Plant Science.
For primary bibliographic entry see Field 05B.
W73-12511

CHENA RIVER LAKES PROJECT, ALASKA, PROBLEMS RELATING TO CHANNEL DEVELOPMENT, EROSION, AND BANK AND LEVEE PROTECTION,
Committee on Channel Stabilization (Army).
For primary bibliographic entry see Field 08B.
W73-12559

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES, HYDRAULIC LABORATORY IVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. P. Bohan, and J. L. Grace, Jr.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-73-4, March 1973. 28 p, 25 pl.

Descriptors: *Lakes, *Hydraulic models, *Reservoirs, *Stratified flow.
Identifiers: *Selective withdrawal.

Laboratory investigations were conducted to determine the withdrawal-zone characteristics created in a randomly density-stratified impoundment by releasing flow through a submerged orifice, over a free and submerged weir, or through a combination of the above. Density stratification was generated in the experimental facilities by creating differentials in both temperature and salinity. Velocity profiles were obtained from movies of dye streak displacements. Through the investigations, generalized relationships for describing the vertical limits of the withdrawal zone and the vertical velocity distribution within the zone have been developed. Techniques for handling conditions in which the water surface or bottom boundary controlled the limits of the withdrawal zone and for describing the composite celovity profile resulting from withdrawal zones which overlapped have also been developed. If the velocity profile and the reservoir width with respect to depth are known, a vertical flow rate distribution can be determined. This flow rate distribution can then be applied as a weighting func-

tion to the reservoir profile of any water-quality parameter to determine its value in the reservoir release. (WES)
W73-12569

DISPOSAL OF DREDGE SPOIL; PROBLEM IDENTIFICATION AND ASSESSMENT AND RESEARCH PROGRAM DEVELOPMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
M. B. Boyd, R. T. Saucier, J. W. Keeley, R. L. Montgomery, and R. D. Brown.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-8, November 1972. 121 p, 1 pl, 1 app.

Descriptors: *Dredging, *Environmental effects, *Spoil banks, *Disposal.
Identifiers: *Dredge spoil.

Report contains results of two study phases of the dredge spoil disposal study: problem identification and assessment and research program development. Result of assessment is that the nature and magnitude of effects of dredging and spoil disposal on water quality and aquatic organisms require extensive research and research is needed to make confined land disposal a viable disposal alternative. A broad-based research program is outlined and recommended to develop a wide choice of technically satisfactory, environmentally compatible, and economically feasible disposal alternatives to cover the wide variety of dredging and disposal operations and environments. In addition to research concerning effects of dredging and open water disposal on water quality and aquatic organisms, ways would be sought to facilitate and improve overall effectiveness and acceptability of land disposal. Attention would be devoted to modifying dredge plant equipment and operational procedures to reduce environmental impact, and to physical, chemical, and/or biological spoil improvement methods. New disposal concepts would be considered along with utilization of spoil for productive uses such as landfill and land enhancement. (WES)
W73-12573

REPORT ON ARKANSAS VALLEY CONDUIT FOR SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT, FOUR CORNERS REGIONAL COMMISSION AND U.S. BUREAU OF RECLAMATION.
Black and Veatch, Kansas City, Mo.

Available from NTIS, Springfield, Va. 22151 as COM-73-10356 Price $3.00 printed copy; $1.45 microfiche. Report, 1972. 127 p, 17 fig, 19 tab, 20 ref, 2 append.

Descriptors: *Water importing, *Colorado, *Rocky Mountain region, *Water transfer, Planning, Water supply, Agriculture, Municipal water, Industrial water, Flood control, Electric power plants, Reservoirs, Recreation facilities, Costs, Pipelines, Water conveyance, Water sources, Evaluation, Water demand.
Identifiers: *Arkansas Valley (Colo).

The Fryingpan-Arkansas Project is a multiple purpose project of the U.S. Bureau of Reclamation involving transmountain diversion of waters from the western slope of the Continental Divide into the Arkansas River basin. The imported waters will provide an additional supply for agriculture, municipalities, and industry. Flood control, recreation, and power generation are other benefits of the project. Pueblo Dam and Reservoir, an element of the project, is presently under construction on the Arkansas River about five miles west of Pueblo. Completion of the dam is anticipated in late 1975. The Southeastern Colorado Water Conservancy District is the legal entity to contract with the Federal Government for purchase and subsequent resale of project waters. Only those entities within the boundaries of the district are eligible to receive project water. However, there are provisions in the State law under which the district operates to permit expansion of the district's boundaries. All feasible ways were studied to supply project waters, raw or treated, to the valley entities for potable purposes, considering both desalting and conventional water treatment methods and, based on these studies, to present the most economical overall supply method. (Woodard-USGS)
W73-12577

FORECASTING STORM-INDUCED BEACH CHANGES ALONG VIRGINIA'S OCEAN COAST,
Virginia Inst. of Marine Science, Gloucester Point.
W. Harrison, P. A. Bullock, and N. A. Pore.
Available from NTIS, Springfield, Va. 22151 as AD-752 141 Price $3.00 printed copy; $1.45 microfiche. Final Contract Report, December 31, 1971. 105 p, 66 fig, 14 tab, 12 ref, 5 append. Contract DACW72-69-C-0031.

Descriptors: *Beach erosion, *Geomorphology, *Sediment transport, *Littoral drift, *Storms, *Virginia, Coasts, Atlantic ocean, Waves (Water), Forecasting, Methodology, Meteorological data, Regression analysis, Sands, Tides, Winds, Currents (Water).
Identifiers: *Beach profile changes.

A method for operational prediction of storm-induced beach changes is presented. The method uses wind and storm-surge data that are predicted on a routine basis by the National Weather Service, NOAA, and it was felt that if such a procedure could be developed, it would be possible to provide estimates of beach erosion or deposition as part of routine weather forecasts whenever storms threatened. Beach profile changes were observed for 18 months at 16 transects along the Virginia ocean coast. Whenever possible profiling was done just before and after storms. Changes in beach sand volume computed from the profile data were correlated by linear multiple regression techniques with (1) analyzed U and V-wind components of the 1000-mb wind for several of the pertinent grid points on the National Meteorological Center's northern hemisphere grid, and (2) ocean stillwater levels recorded at two tide gages. The correlation studies did not yield completely reliable predictor equations. (Woodard-USGS)
W73-12584

HORTON'S 1945 STUDY: A CARTOBIBLIOGRAPHY,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 07C.
W73-12596

CONTROL OF UNDERSEEPAGE BY RELIEF WELLS, TROTTERS, MISSISSIPPI; APPENDIX K: 1969 PUMPING TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12597

EFFECTS OF STREAM CHANNELING ON WETLANDS IN A MINNESOTA WATERSHED,
New Brunswick Fish and Wildlife Branch, Fredericton.
J. S. Choate.
J Wildl Manage. Vol 36, No 3, p 940-944. 1972. Illus.
Identifiers: Channeling, *Minnesota, *Stream channeling, Watersheds, *Wetlands, Wildlife.

Over 60 miles of stream was channeled in the lower 3/4 of the Hawk Creek Watershed, west-central Minnesota. The channels permitted more rapid removal of flood waters but also encouraged construction of ditches and tiles by providing improved outlets. Wetlands valuable to waterfowl and other wildlife were drained as a result. On a percentage basis, wetland loss in the lower part of the watershed was nine times greater than in the unchanneled upper quarter.--Copyright 1973, Biological Abstracts, Inc.
W73-12667

PUBLIC LAND USE POLICY: NEEDS, OBJECTIVES, AND GUIDELINES,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Journal of Soil and Water Conservation, p 195-201, September-October, 1972. 2 fig, 12 ref. OWRR A-999-IA (6).

Descriptors: *Land use, *Legislation, *Decision making, Long-term planning, Environment, Land management, Standards, Costs, Methodology, Social participation, Governmental interrelations, Land tenure.
Identifiers: *Land use policy, Policy formulation, Guidelines.

Evidence supports widespread recognition by the public, governments and the academic community of the need for developing land use policies. The subject deserves careful consideration when the initial policies are formulated. Towards this goal a general discussion of alternative concepts of land, various land uses which might constrain the selection of land tenure systems, and goals of land use policy is provided. The vast variety of land uses and the availability and choice of technologies involved necessitate the development of a policy that specifies the range of choice among alternatives, given desired social objectives. Land resource use and environmental quality must be approached in conjunction with other national goals. Effective land use policy must be based on facts and logic widely understood and accepted by the public. Guidelines for the formulation of effective policy include definition of policy objectives which are flexible, sensitive to results of continued research and evaluation, founded upon a consistent, integrated system of programs involving all levels of government and perhaps even open to change of traditional concepts. (Weaver-Wisconson)
W73-12697

INVESTIGATION OF MINERAL NUTRIENT CYCLING IN UPLAND PIEDMONT FOREST,
Forest Service (USDA), Research Triangle Park, N.C. Forest Science Lab.
C. Wells, D. Whigham, and H. Leith.
J Elisha Mitchell Sci Soc. Vol 88, No (2), p 66-78, 1972. Illus.
Identifiers: Forests, Hardwood, Litterfall, Loblolly, Minerals, *Nutrient cycling (Minerals), *Piedmont forests, Pines, Precipitation, Stemflow, Throughfall.

Nutrient cycling was investigated in a mixed hardwood and a natural loblolly pine stand. Measurements were made of the mineral element content of precipitation alone, throughfall, stemflow and litterfall. Total litterfall was 25% greater in the hardwood than in the pine. N and Ca in the litterfall were respectively 70 and 250% greater in the hardwood than in the pine. Hardwood litter contained about twice as much K, Mg, Mn, Cu, Na and Al as did the pine stand. More N, K, Ca and Mg was washed from the hardwood canopy trees than from the pine. A greater amount of K was contributed by throughfall than by litterfall.--Copyright 1973, Biological Abstracts, Inc.
W73-12700

VALUATION OF TIMBER, FORAGE AND WATER FROM NATIONAL FOREST LANDS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.

For primary bibliographic entry see Field 06B.
W73-12701

COST CURVES FOR CROSS-DRAINAGE WORKS,
Government Coll. of Engineering, Aurangabad (India).
A. S. Tongaonkar.
Irrigation and Power, Vol 28, No 4, p 391-398, 1971. 7 fig, 2 tab.

Descriptors: *Cost analysis, *Canal construction, Conveyance structures, Graphical analysis, Construction costs, Aqueducts, Culverts.
Identifiers: *India (Maharashtra).

Either an aqueduct or culvert is required as a cross-drainage work to take a canal over a natural drainage. Because the cost of such a structure is dependent on many factors other than waterway availability, comparative cost analysis must provide decision criteria for site and structure selection. In addition, cost curves should corelate with canal and stream conditions. Cost curves for the Paithan Left Bank Canal of Jayakwadi Project Stage I (Godavari Project at Paithan, India) are constructed. In order to determine an appropriate means of corelating stream and canal conditions the relationship between barrel length of each culvert and cost of barrel was investigated and found to be linear. Total cost of culvert and barrel length generated a curve of initially steeper slope, thus indicating that structural items represent a large percentage of total cost and that total cost is directly related to total length of pipes. Total cost was linearly related to the waterway provided while the relationship between total cost and volume of the barrel traced a smooth curve. (Weaver-Wisconsin)
W73-12704

GROUND WATER MODELS WITH PARALLEL LINEAR RESERVOIRS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 02F.
W73-12723

A SUGGESTED NEW APPROACH TO THE ANALYSIS OF DRAINAGE BASIN SHAPES,
Monash Univ., Clayton (Australia).
L. J. Hobba, and G. Robinson.
Area (Institute of British Geographers), Vol 4, No 4, p 242-251, 1972. 5 fig, 1 tab, 21 ref.

Descriptors: *Geomorphology, *Drainage patterns (Geologic), *Watersheds (Basins), *Terrain analysis, Topography, Valleys, *Australia.

Measures of the shape of drainage basins are reviewed and a new measure is suggested which takes into account all three dimensions of a basin. The shape indices which result are tested for a set of basins in Australia. The approach which is suggested involves the generalization of the three-dimensional form of the basin by the placement inside it of a framework of lines joining 'pivot' points within and on the perimeter of the individual catchment. The primary point A is located at the stream mouth. Point B is defined as the point where the main stream of the basin crosses the contour at which a $/A \pm 0.5$, where a and A are the areal measures used in the calculation of Strahler's hypsometric integral. G is a point projected vertically above B. Points C and D are fixed by the intersection of a line drawn perpendicular to AB through G and the basin perimeter. E is the point on the catchment circumference furthest distant in a straight line from A. (Knapp-USGS)
W73-12729

SOME EXAMPLES OF DRAINAGE COMPONENT ANALYSIS,
Malaya Univ., Kuala Lumpur (Malaysia).
R. P. C. Morgan.
Area (Institute of British Geographers), No 4, p 37-41, 1970. 2 fig, 1 tab, 6 ref.

Descriptors: *Geomorphology, *Hortons Law, *Drainage patterns (Geologic), Drainage density, Tributaries.
Identifiers: *Strahlers law, England, Malaysia.

First-order drainage components in third-order basins are analyzed in humid, vegetated conditions of southeast England and West Malaysia. That different environments result in different upper magnitudes is indicated by an analysis of comparing the components of the lower altitude slopes covered with rubber plantations with those of the steeper jungle covered terrain where local relief is greater. Second- order drainage develops more rapidly where the steeper slopes may be expected to produce greater surface runoff. Studies carried out in southeast England with environmental conditions of a local relief between 30 and 200 meters and hypsometric integrals around 30% show differences in the upper magnitudes attained by first-order components on three different rock types. On the Tunbridge Wells Sands, the frequency pattern reflects the presence of some very long first-order segments. The distribution pattern is interpreted in the light of the drying up of the valley heads following a fall in the water table. (Knapp-USGS)
W73-12734

A NOTE ON STREAM ORDERING,
University Coll. of Wales, Aberystwyth.
J. Lewin.
Area (Institute of British Geographers), No 2, p 32-35, 1970. 1 fig, 1 tab, 16 ref.

Descriptors: *Geomorphology, *Hortons law, *Drainage patterns (Geologic), Drainage density, Tributaries.
Identifiers: Shreves law.

The number of stream ordering procedures now available is such that it is more than ever necessary to decide on the best to use. Apart from the intrinsic elegance of the various quantitative relationships revealed, a practical criterion against which they may be judged is the degree to which order is proportional to stream status as manifested in size of catchment, number and lengths of contributing streams, stream discharge, or channel dimensions. An ordering system ought to relate to stream status unaffected by the way in which streams or links are combined together. Shreve's proposal to use simply the number of first-order links as an index of magnitude is most useful in this respect. To assess topological structure as well as magnitude, Shreve's magnitude system can be varied. (Streams above which are two links become second order, above which there are four links are third order, and so on.) The system is thus logarithmic. If the number of links or segments per order is then plotted on log graphpaper, A- and B-type networks appear contrasted. (Knapp-USGS)
W73-12735

THE SUPERIMPOSITION HYPOTHESIS FOR INCISED MEANDERS--A GENERAL REJECTON AND SPECIFIC TEST,
Makerere Univ., Kampala (Uganda).
For primary bibliographic entry see Field 02E.
W73-12736

CLIMATIC CHANGE AND ARRESTED MEANDER DEVELOPMENT ON THE RIVER SEVERN,
Wisconsin Univ., Madison.
G. H. Dury, C. A. Sinker, and D. J. Pannett.
Area (Institute of British Geographers), Vol 4, No 2, p 81-85, 1972. 1 fig, 17 ref.

Descriptors: *Geomorphology, *Valleys, *Meanders, *Topography, Glaciation, Pleistocene epoch, Terraces (Geologic), Drainage patterns (Geologic), Channel morphology, Paleoclimatology.
Identifiers: *Severn River (England).

The drainage of the upper Severn, England, has been strongly affected by a major climatic change. Some of its landforms are harmonious, others disharmonious with the climate of today. Stream shrinkage and channel filling occurred during the span 9000-8000 BP. A span of only 5,000 years included deglaciation, development of valley meanders, ingrowth of these meanders, and diminution of the streams to underfitness. The climatic events of this very brief interval impressed patterns that still survive in disharmony with the present climate. The geomorphic changes between large former and small present day meander traces and channel cross-sections, and between the associated spacing of pools and riffles exemplify step functions. Passage from step to step exemplifies the substitution of one quasi-equilibrium state for another. The contrast between the adjustment of channel cross-section and the adjustment of the long profile of the channel bed, as well as the lack of development of new stream meanders shows that some of the elements of channel morphology are out of phase with climatic changes. (Knapp-USGS)
W73-12737

EVALUATION OF HERBICIDES FOR SUBMERGED WEEDS IN CHAMBAL AND BHAKRA-NANGAL CANAL SYSTEMS,
Indian Grassland and Fodder Research Inst., Jhansi. Div. of Weed Ecology Control.
For primary bibliographic entry see Field 05G.
W73-12738

A PROPOSED STREAMFLOW DATA PROGRAM FOR CONNECTICUT,
Geological Survey, Hartford, Conn.
M. P. Thomas, and M. A. Cervione Jr.
Connecticut Water Resources Bulletin No 23, 1970. 18 p, 2 fig, 8 tab, 5 ref, append.

Descriptors: *Streamflow, *Project planning, *Connecticut, *Flow characteristics, Data collections, Programs, Water utilization, Water supply, Natural flow, Rivers, Streams, Regulated flow, Streamflow forecasting, Regression analysis, Hydrology, Hydrologic data, Gaging stations.

An evaluation of the streamflow data available in Connecticut was made to provide guidelines for planning future programs. Goals for a streamflow data program are identified with four classifications of streamflow data: (1) data for current use, (2) data for planning and design, (3) data to define long-term trends, and (4) data on stream environment. For principal streams draining more than 500 square miles, accuracy goals proposed for this classification of streamflow data are accuracy equivalent to that of a 25-year record, and for minor streams draining less than 500 square miles, accuracy equivalent to that of a 10-year record. The study shows that for all unregulated streams, goals relating streamflow characteristics to drainage basin characteristics. Long-term characteristics of flow in regulated streams will be determined by methods yet to be developed. (Woodard-USGS)
W73-12748

STAGE-DISCHARGE RELATIONS ON BIG LOST RIVER WITHIN NATIONAL REACTOR TESTING STATION, IDAHO,
Geological Survey, Idaho Falls, Idaho. Water Resources Div.
R. D. Lamke.
Open-file report IDO-22050, March 1969. 29 p, 30 fig, 7 ref.

Descriptors: *Stage-discharge relations, *Streamflow, *River forecasting, *Idaho, Theoretical anal-

ysis, Methodology, Rainfall-runoff relationships, Floods, Flood forecasting, Mathematical studies, Rating curves.
Identifiers: National Reactor Testing Station (Idaho).

Theoretical stage-discharge relations were computed for 11 selected sites on the Big Lost River system in Idaho within the National Reactor Testing Station. Rating curves were computed by various techniques, which are dependent upon the hydraulic characteristics of each site. Relative accuracies of the rating curves are shown by correlating curves of higher accuracy with curves of lower accuracy. The rating curves apply only for the stated conditions and for the physical and hydraulic characteristics existing in April 1968. After a large flood the curves could be considerably different because of erosion of the channels, dikes, and road embankments. Also, the curves for the culverts are for conditions of no debris at the entrances and in the barrels. Datum used is mean sea level. (Woodard-USGS)
W73-12750

THE BENTHIC FAUNA IN FOUR SMALL SOUTHERN APPALACHIAN STREAMS,
Georgia Univ., Athens. Dept. of Entomology.
For primary bibliographic entry see Field 02I.
W73-12784

CENCHRUS CILIARIS--A PERENNIAL PASTURE GRASS OF ARID AND SEMI-ARID AREAS,
Haryana Agricultural Univ., Hissar (India).
A. S. Faroda, and P. S. Tomer.
Indian Forester, Vol 97, No 12, p 675-680, December 1971. 50 ref.

Descriptors: *Forage grasses, *Pastures, *Forage palatability, *Drought resistance, *Soil conservation, Ranges, Arid climates, Semiarid climates, Plant growth, Soil-water-plant relationships, Planting management, Seeds, Application methods.

Cenchrus ciliaris is one of the dominant perennial grasses producing good quality forage in pastures and rangelands of arid and semiarid tracts. Its palatability tests have indicated that from preflowering stage till dead ripestage, it is comparable to other palatable grasses. It is widely adaptable grass native to tropical and South Africa, India and Indonesia, but now grown in Rhodesia, Uganda, Kenya, Somaliland, India, Tanganyika, Sudan, South Africa, Libya, U.A.R., Australia, and Pakistan. It provides excellent protection against soil erosion and checks the widening and deeping of gullies because of its soil binding capacity. Because of its adaptability to a wide range of soil and climatic conditions, it has a high degree of drought resistance, and extreme arid and humid conditions do not deter its growth. The most effective time for sowing this grass in arid and semiarid tracts is after the first effective rainfall. The seed rate varies with soil, rainfall and climatic conditions, with 2.25 kg seed per hectare sufficient for arid areas. Information is also given on spacing, mixtures, varieties, interculture, iver. (Gloyd-Arizona)
W73-12790

HIGH-ALTITUDE FORESTS AND GRASSLANDS OF MT. ALBERT EDWARD, NEW GUINEA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
K. Paijmans, and E. Loffler.
J Trop Geogr. 34, p 58-64, 1972, Illus.
Identifiers: Ferns, Fire, *Forests (High altitude), *Grasslands, *New Guinea (Mt. Albert Edward), Swamps, Topography, Trees.

The pattern emerging from the study of the Mt. Albert Edward area probably applies to most high mountains in New Guinea. A broad correlation is demonstrated between vegetation and topography and drainage, while superimposed on this is a haphazard burn pattern caused by irregular and patchy fires. The mountainsides and 70% of the summit plateau were formerly forested. Natural swamp grassland areas in the formerly glaciated section serve as fire nuclei within the forest. Tree fern savannas are a disclimax caused by fire in previously forested terrain. The study area and similar areas in New Guinea are gradually being impoverished by intensive burning and hunting, and there is an urgent need for conservation.--Copyright 1973, Biological Abstracts, Inc.
W73-12824

ESTIMATING SNOW-WATER EQUIVALENT FROM POINT-DENSITY MEASUREMENTS OF FOREST STANDS,
Canadian Forest Service, Edmonton (Alberta).
D. L. Golding, and R. L. Harlan.
Ecology. Vol 53, No 4, p 724-725, 1972, Illus.
Identifiers: Abies-lasiocarpa, Density, *Firs, *Forests, Measurements, Picea-engelmanii, Regression, Seasonality, *Snow, *Spruce fir, Trees.

To define the cumulative influence of adjacent trees on snow accumulation, the Bitterlich point-sampling technique was used with 4 angle sizes in an area of relatively homogeneous spruce-fir (Picea engelmanii-Abies lasiocarpa) with similar slope-aspect conditions. Snow-water equivalent at 50 points for 10 measurement dates was correlated with point density. Correlations were higher for that point density determined with angle 147.34 min than for the angles 73.66, 104.18, and 208.38 min. A linear regression model combining weighted point-density measurements using three angle sizes gave the highest correlations. There was a trend of increasing correlation from Jan. to April.--Copyright 1973, Biological Abstracts, Inc.
W73-12827

CONSIDERATIONS FOR EFFECTIVE SLOPING LAND DRAINAGE SYSTEMS,
Agricultural Research Service, Burlington, Vt. Soil and Water Conservation Research Div.
G. R. Benoit, and J. Bornstein.
Soil Sci Soc Am Proc. Vol 36, No 5, p 819-823. 1972. Illus.
Identifiers: Bypass, Climate, *Drainage systems, Equation, Flow, *Land drainage (Sloping), Seismograph analysis, Soils, Transpiration, Evapotranspiration, *Vermont, Water balance.

A 12-plot sloping land drainage study in East Franklin, Vermont, is located on a model Cabot silt loam-a poorly-drained glacial till fragipan soil. The plots consist of all combinations of 2 depths (30 and 51 cm) and 2 spacings (61 and 122 m) of surface drains (diversions) and 3 spacings (none, 30.5, and 61 m) of subsurface drains located 102 cm deep. Drainage, soil water, and climatic data were used to evaluate a water balance equation for each drain for 6 selected drainage intervals. A seismographic analysis showed vibrations in soil depth as related to bedrock configuration. The results showed great variation in drain performance between drains in the same interval and between intervals for the same drain. Wide differences observed between values for drainage plus soil water storage and rainfall minus potential evapotranspiration seemed to be related to initial soil water content, the gain or loss of soil water, and the magnitude of potential evapotranspiration. Greatest drainflow occurred from those subdrains located at points of shallowest soil depths with bypass flow occurring under the drains particularly during saturated conditions. A drainage system for wet sloping soil should include: surface drains for controlled removal of snowmelt surface runoff; subsurface drains located at the top of bedrock dropoffs, where the bedrock is closest to the soil surface; subsurface drains systematically spaced between these drains to intercept bypass flow before it reaches downslope soil surface areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12933

PRELIMINARY FLOOD-FREQUENCY RELATIONS FOR SMALL STREAMS IN GEORGIA,
Geological Survey, Atlanta, Ga.
H. G. Golden.
Open-file report, April 1973. 29 p, 8 fig, 5 tab, 15 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Flood peak, *Small watersheds, *Georgia, Hydrologic data, Regression analysis, Peak discharge, Streams, Streamflow, Mathematical studies, Equations, Climatic data, Topography, Geomorphology, Drainage area, Gaging stations, Flood control, Planning, Flood plains.

New flood information from 102 small basins (0.1 to 20 sq mi), not available for previous flood-frequency analyses, and data available from 120 larger drainage basins (20 to 1,000 sq mi) have been analyzed to provide planners and designers with preliminary relations for estimating the magnitude and frequency of flood peak discharges on small streams in Georgia. A program to collect and analyze flood peak data from small natural drainage basins was begun in 1963 by the U.S. Geological Survey in cooperation with the Department of Transportation of Georgia and the U.S. Department of Transportation. The Q2 (2-year flood) peak discharges were determined from flood-frequency curves for each of the small-stream stations. Multiple regression was used to define the relation between Q2 station data and selected physical and climatological basin characteristics. Statistically significant characteristics were drainage area, soils-infiltration-capacity index, and precipitation intensity. Equations were developed for three regions in the State, roughly delineated by three physiographic provinces. Equations for estimating Q50 (50-year flood) discharge were developed from the Q2 equations by the ratio method using the station flood-frequency data computed for the large stations. The equations are considered usable for any site in Georgia where the drainage area is between 0.1 and 20 sq mi and where the flood flow is virtually natural. The approximate standard error of estimate of the Q50 equation is 41% in Region I (Valley and Ridge and Blue Ridge Province), 48% in Region 2 (Piedmont Province), and 37% in Region 3 (Coastal Plain Province.) (Woodard-USGS)
W73-12946

MAYAK, RUSSIAN WILD RYEGRASS,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
T. Lawrence.
Can J Plant Sci. Vol 52, No 1, p 121-122. 1972.
Identifiers: Canada, Cultivars, Elymus junceus M, *Mayak, *Rye grass.

'Mayak' is the second cultivar of Russian wild ryegrass (Elymus junceus Fisch.) to be released by the research station at Swift Current, Saskatchewan, Canada.--Copyright 1972, Biological Abstracts, Inc.
W73-12974

4B. Groundwater Management

ANALYSIS OF SEEPAGE INTO GROUND--WATER SYSTEM,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
A. A. Abiodun.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, p 1203-1208, July 1973. 8 fig, 7 ref, append.

Descriptors: *Seepage, *Recharge, *Groundwater movement, Infiltration, Canal seepage, Artificial recharge.

Analytical methods were developed to simulate seepage into a groundwater system from a range of geometries. The solutions to such problems might find practical application in situations where subsurface lateral distribution of seepage flows is to be restricted and also in cases where porous medium that is to be replenished is overlain by a fairly thin impermeable layer. The particular case chosen is that of seepage through a channel with impervious side walls and permeable bottom. The driving force of the flow system is the force of gravity and the flow is two-dimensional. The seepage flows are steady and fully saturated, taking place in an isotropic, homogeneous, porous medium, and Darcy's Law is applicable. The solution to this problem was obtained through the application of the hodograph technique. (Knapp-USGS)
W73-12412

ENVIRONMENTAL ISOTOPES AND CIRCULATION IN AQUIFERS UNDER VENICE (ISOTOPES DU MILIEU ET CIRCULATIONS DANS LES AQUIFERES DU SOUS-SOL VENITIEN),
Turin Univ. (Italy). Istituto di Geologia e Paleontologia.
For primary bibliographic entry see Field 02F.
W73-12419

SELECTED DATA ON WELLS IN THE BARSTOW AREA, MOJAVE RIVER BASIN, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. L. Hughes, and D. L. Patridge.
Open-file report, March 26, 1973. 102 p, 10 fig, 4 tab.

Descriptors: *Well data, *Water wells, *Aquifer characteristics, *Water quality, *California, Basic data collections, Hydrologic data, Water levels, Chemical analysis, Water analysis, Water utilization, Water level fluctuations.
Identifiers: *Barstow area (Calif).

In June 1971 the U.S. Geological Survey, in cooperation with the U.S. Marine Corps and the California Regional Water Quality Control Board, Lahontan Region, began an investigation of the degradation of groundwater in the Barstow area, Mojave River basin, California. The study area is in parts of the lower and middle Mojave River basin, San Bernardino County, an area of about 200 square miles. The principal towns are Barstow, Lenwood, and Daggett, with major Marine Corps Supply Centers at Nebo, Yermo, and Daggett. Industry includes the Marine Corps supply activities and the Atchison, Topeka, and Santa Fe Railway, with regional maintenance facilities in Barstow. This compilation makes available selected well records, water level measurements, and water quality data which will be useful in future water resources planning, and which will provide part of the basic data for a study of water quality degradation in the area. Wells are listed in numerical order by township, range, and section according to the well-numbering system used in California. For the most part, well data were obtained from records maintained by the Geological Survey and from visits by Geological Survey personnel to the wells and to well owners. (Woodard-USGS)
W73-12421

GEOHYDROLOGY OF THE DOVER AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-12425

PHYSICAL CHARACTERISTICS OF BASALT AQUIFERS,
Washington State Water Research Center, Pullman.
J. W. Crosby, III, and J. C. Mellott.
Available from the National Technical Information Service as PB-222 284, $2.75 in paper copy, $1.45 in microfiche. Completion, Report June 1973. 5 p, 10 ref. OWRR A-021-WASH (2).

Descriptors: *Groundwater movement, *Basalts, Hydrogeology, Geophysics, *Electrical well logging, *Borehole geophysics, Aquifer characteristics, Logging (Recording).

Determination of certain physical characteristics of basalts which influence the transmission and storage of ground waters was accomplished, using borehole geophysical techniques and composite log interpretation practices. This research led to a number of larger research projects directed to geophysical studies of the basalts. By using digitized data from the geophysical logs an averaging technique was developed which permits the assigning of an effective permeability value to 20-foot vertical sections of the basalt. These effective permeabilities are used in computer models which evaluate the areal distribution of hydraulic potential in successive 20-foot vertical 'slices' through the basalt. Attempts to determine potential values on a hybrid computer through anology with Ohm's Law were not totally successful because of the limited storage capabilities, and ultimately the analysis was completed on the IBM-360 computer.
W73-12523

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS, VOLUME II,
Missouri Univ., Rolla. Dept. of Geological Engineering.
For primary bibliographic entry see Field 05E.
W73-12576

GROUND-WATER RESOURCES, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12578

GEOLOGY OF NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12579

PRESIDIO BOLSON, TRANS-PECOS TEXAS AND ADJACENT MEXICO: GEOLOGY OF A DESERT BASIN AQUIFER SYSTEM,
Texas Univ., Austin.
For primary bibliographic entry see Field 02F.
W73-12585

CONTROL OF UNDERSEEPAGE BY RELIEF WELLS, TROTTERS, MISSISSIPPI; APPENDIX K: 1969 PUMPING TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12597

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
E. Olson, T. L. Dobbs, G. H. Pfeiffer, and G. Wedemeyer.
In: Annual meeting of Western Agricultural Economics Association, Commercial Agriculture--Management session, July 24, 1972, Logan Utah. 8 p, 3 tab, 5 ref. OWRR A-001-WYO (57) OWRR A-002-WYO (3).

Descriptors: *Water supply development, *Agriculture, *Financing, *Return (Monetary), Loans, *Wyoming, State governments, Interest, Investment, Appreciation, Sprinkler irrigation, Groundwater resources.
Identifiers: *Public financing, *Net return, Forage crops, Cash crops.

The State of Wyoming has been involved with support of private farm operators in adopting new technology for irrigation of agricultural lands through low-interest loans for center-pivot sprinkler systems. Most of these systems have facilitated the development of new underground water supplies. The results of the analysis concerning alternative methods of irrigation system financing, and the effects of State financed irrigation investments on the growth of farm firms are discussed. Data were collected from published research, secondary sources, and interviews. It was concluded that the State's support program was only partially successful in achieving its anticipated purposes. However, State financing, as compared to alternative means of financing, provided distinct advantages to investors. Thus, utilization of groundwater supplies by agriculture has proceeded at a more rapid rate than it otherwise would have. Except at the margin, it was found that investment in sprinklers for cash crop operations would have occurred in the absence of the State program; sprinkler investments result in net return and firm growth effects of considerable magnitude in production of cash crops such as sugarbeets and potatoes. Results for livestock operation were mixed. (Weaver-Wisconsin)
W73-12698

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
J. R. Harrill.
Nevada Department of Conservation and Natural Resources Water Resources Bulletin No 42, 1973. 130 p, 13 fig, 27 tab, 21 ref, 2 append.

Descriptors: *Groundwater resources, *Water resources development, *Aquifer characteristics, *Water wells, *Nevada, Water supply, Pumping, Water yield, Groundwater recharge, Water utilization, Imported water, Water quality, Chemical analysis, Well data, Surface waters, Evaporation, Hydrology.
Identifiers: *Lemmon Valley (Nev).

This study, made in cooperation with Washoe County, City of Reno, and Nevada Department of Conservation and Natural Resources, reappraises the water resources of Lemmon Valley, a small valley of about 93 square miles north of Reno, Nevada. Intense faulting and fracturing associated with the Walker Lane fault zone have formed barriers to groundwater movement in the valley-fill reservoir and have created permeable zones in consolidated rocks which not only store water but also probably transmit some water out of the valley. Under natural conditions, recharge and discharge average about 1,400 acre-feet per year--about 900 in Silver Lake subarea and 500 in East Lemmon subarea. During 1971 about 900 acre-feet of imported water was used by about 2,700 persons living at Stead Facility (formerly Stead Air Force Base), including industrial use. As of September 1971, the State Engineer had issued permits to pump about 15,000 acre-feet per year in Lemmon Valley. If pumping is not strategically distributed with respect to the supply, local overdraft may develop even though no valley-wide overdraft exists. In 1971 the chemical quality of groundwater was acceptable for most uses. Exceptions to this are accumulations of naturally salty water beneath the playas in both subareas and some wells affected by local conditions. (Woodard-USGS)
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
L. J. Nutter.
Maryland Geological Survey Report of Investigations No 19, 1973. 70 p, 26 fig, 2 plate, 8 tab, 51 ref, append.

Descriptors: *Groundwater resources, *Water wells, *Water supply, *Water quality, *Maryland, Aquifer characteristics, Hydrogeology, Well data, Water yield, Water level fluctuations, Pumping, Specific capacity, Water utilization, Groundwater recharge, Geochemistry, Chemical analysis.
Identifiers: *Frederick and Hagerstown Valleys (Md).

The Frederick and Hagerstown Valleys in western Maryland are underlain predominantly by Cambrian and Ordovician limestones and dolomites and contain many karst features (sinkholes, large springs, subsurface drainage, and closed depressions) characteristic of carbonate-rock terranes. Analysis of the water budget of a principal basin in Hagerstown Valley indicates that precipitation is about 35 inches, total runoff about 12 inches, and evapotranspiration about 23 inches. Hydrograph separation at three gaging stations in the Hagerstown Valley for 1967 showed that base flow (groundwater dishcarge) is about 80% of the total runoff. Topography is controlled largely by joints, faults, and bedding and is very useful for selecting well sites where high yielding wells are likely. Water wells in valleys have a median specific capacity of 1.0 gpm per ft compared with 0.09 gpm per ft for wells located on hilltops and upland areas. The hydraulic properties of carbonate rocks differ greatly from place to place. The transmissivity ranges from less than 10 to 31,000 square feet per day. The chemical quality of the groundwater is influenced by the mineralogy of the carbonate-rock aquifers. The water is hard or very hard, and the use of water softeners is fairly common. Nitrate concentration exceeded the limit recommended by the U.S. Public Health Service of 45 mg/liter in 37 of the 139 samples analyzed. (Woodard-USGS)
W73-12719

GROUND WATER MODELS WITH PARALLEL LINEAR RESERVOIRS,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 02F.
W73-12723

ARTIFICIAL RECHARGE OF GROUNDWATER AND INFILTRATION BASINS (ISKUSSTVENNOYE VOSPOLNENIYE ZAPASOV I INFIL'TRATSIONNYYE VODOZABORY PODZEMNYKH VOD),
V. S. Usenko.
Izdatel'stvo 'Nauka i Tekhnika', Minsk, 1972. 255 p.

Descriptors: *Artificial recharge, *Induced infiltration, *Groundwater recharge, *Groundwater, Water spreading, Water purification, Water pollution, Water quality, Filtration, Filters, Water chemistry, Chemical reactions, Physiocochemical properties, Biological properties, Bacteria, Invertebrates, Algae, Water works, Lysimeters, Hydrogeology.
Identifiers: *USSR, *Germany, *Infiltration basins.

Artificial-recharge practice in the USSR and abroad, and physicochemical and biological principles of artificial groundwater recharge are discussed. Infiltration basins in the USSR and expecially in the two German Republics are described, and data are presented on their operation and efficiency. (Josefson-USGS)
W73-12745

COMPARISON OF WATERFLOOD CORROSION DETECTION AND MONITORING DEVICES,
Atlantic Richfield Co., Bakersfield, Calif.
For primary bibliographic entry see Field 08G.
W73-12757

SIMPLIFIED SOLUTION FOR DECREASING FLOW IN WELLS,
California Univ., Davis. Dept. of Irrigation.
For primary bibliographic entry see Field 08B.
W73-12759

SAND CONTROL - 3. CHEMICAL CONSOLIDATION,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 08G.
W73-12760

HERE'S A NEW SAND PACK METHOD,
Halliburton Services, Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W73-12761

MICELLAR SOLUTIONS STIMULATE WELLS,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W73-12762

LEACHING OF CEMENT FROM A CONCRETE PILE SECTION BY GROUNDWATER FLOW,
Cementation Co. Ltd., London (England).
For primary bibliographic entry see Field 08F.
W73-12766

CORROSION MONITORING METHOD REDUCES EFFECT OF VARIABLES IN ANALYZING OIL FIELD WATERS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
For primary bibliographic entry see Field 08G.
W73-12767

PROBLEMS OF GROUNDWATER POLLUTION BY BRINE,
Public Health Service, Dallas, Tex. Region VII.
For primary bibliographic entry see Field 05B.
W73-12770

RATIONAL DESIGN OF WELL SCREENS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 08B.
W73-12771

PITLESS UNITS AND ADAPTERS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 08G.
W73-12776

WATER LEVELS NEAR A WELL DISCHARGING FROM AN UNCONFINED AQUIFER,
Geological Survey, Washington, D.C.
I. Remson, S. S. NcNeary, and J. R. Randolph.
Water Supply Paper 1536-B, p 27-39, 1961. 10 fig, 2 tab, 9 ref.

Descriptors: *Wells, *Aquifer characteristics, Analytical techniques, Equations, Hydrologic data, *Drawdown, Hydraulics.
Identifiers: Unsaturated flow, *Unconfined saturated flow, *Unsteady radial flow.

The differential equation describing unsteady radial flow to a well in an unconfined aquifer has no simple solution in terms of elementary functions because the transmissibility decreases as the aquifer is dewatered. A numerical solution and type curves are presented showing the head of water in a homogeneous aquifer as a function of radial distance from the well and time elapsed after the water level in the well is lowered to and maintained at a given level. This solution is similar to one presented by J. R. Phillip in 1955 for linear diffusion in a flow system in which diffusivity is concentration dependent. (Campbell-NWWA)
W73-12777

WASTE DISPOSAL WELL PERFORMANCE,
Monsanto Biodize Systems, Inc., Great Neck, N.Y.
For primary bibliographic entry see Field 05E.
W73-12779

THE DESIGN AND OPERATION OF DEEP--WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
For primary bibliographic entry see Field 05E.
W73-12780

THE DISPOSAL OF WASTEWATER UNDERGROUND,
For primary bibliographic entry see Field 05E.
W73-12781

POLIOVIRUS IN A WATER SUPPLY,
Michigan Dpt. of Public Health, Lansing. Bureau of Environmental Health.
For primary bibliographic entry see Field 05B.
W73-12922

SALT POLLUTION OF A SHALLOW AQUIFER--INDIANAPOLIS, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Geography and Geology.
For primary bibliographic entry see Field 05B.
W73-12940

EVALUATION OF A SHALLOW LEAKY WATER TABLE AQUIFER IN A SUBHUMID REGION OF FRANCE,
For primary bibliographic entry see Field 02F.
W73-12941

FLOW TO WELLS NEAR STREAMS IN THE PRESENCE OF DELAYED YIELD FROM STORAGE AND ANALYSIS OF PUMPING TEST DATA,
Bulgarian Academy of Sciences, Sofia. Geological Inst.
I. G. Yotov.
Ground Water, Vol 11, No 4, p 42-45, July-August 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Surface-groundwater relationships, *Water yield, *Storage coefficient, *Groundwater movement, *Drawdown, Laplaces equation, Induced infiltration, Equations, Specific yield, Hydrogeology.

Drawdown around pumping wells in aquifers near streams was calculated, including the effect of delayed yield from storage, using the image theory. Two methods are presented for determining the aquifer constants. The first method is based on the type curves for the initial moments of pumping and for later ones. The Carson-Laplace transforms of drawdown field data are required for applying the other method. A field example is used for illustration. (Knapp-USGS)
W73-12943

HYDRAULICS OF SHEETLIKE SOLUTION CAVITIES,
Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.

G. K. Moore.
Ground Water, Vol 11, No 4, p 4-11, July-August 1973. 9 fig, 10 ref.

Descriptors: *Hydrogeology, *Karst hydrology, *Limestones, *Tennessee, Fractures (Geologic), Laminar flow, Groundwater movement, Hydraulics, Hydrodynamics, Aquifer testing, Darcys law, Theis equation, Aquifer characteristics.

The sheetlike solution cavities that supply water to most wells in central Tennessee are 100 to 2,500 feet wide and less than 0.2 inch high. These dimensions have a scale similar to those in Hele-Shaw models. Both logical and mathematical evidence indicate laminar groundwater flow, except close to pumping wells. The Theis nonequilibrium formula may be used to analyze aquifer-test data and to calculate significant values for transmissivity and storage. The Navier-Stokes equation and the Darcy equation for steady-state conditions may be used to estimate cavity dimensions. (Knapp-USGS)
W73-12944

SOURCES OF DATA FOR EVALUATION OF SELECTED GEOTHERMAL AREAS IN NORTHERN AND CENTRAL NEVADA,
Geological Survey, Menlo Park, Calif.
F. H. Olmsted, P. A. Glancy, J. R. Harrill, F. E. Rush, and A. S. Van Denburgh.
Open-file Report, April 1973. 78 p, 1 fig, 277 ref.

Descriptors: *Geothermal studies, *Nevada, *Information retrieval, *Publications, Heat flow, Geophysics, Geochemistry, Geology, Thermal water, Thermal properties, Thermal springs, Natural resources, Water temperature, Chemical analysis, Mineralogy.
Identifiers: Sources of data, Geothermal areas (Nev).

Sources of published and unpublished data are listed for areas in northern and central Nevada selected on the basis of geologic, geophysical, geochemical, and heat-flow evidence as being the most promising for the development of geothermal resources. Each geothermal area consists of one or more hydrographic areas, as defined by the office of the Nevada State Engineer and the U.S. Geological Survey (Scott and others, 1971), and contains one or more major hydrothermal discharge outlets. Not all place names in the report are shown on the map in the pocket; those not shown may be found in the references cited. The data categories are those required to define the geothermal reservoir parameters (boundaries, effective porosity, intrinsic permeability, specific storage, and chemical and mineralogical composition of rocks), fluid and temperature parameters, and sources and rates of input and output of heat and fluid. (Woodard-USGS)
W73-12947

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-12949

SOLUBLE SILICA AND FLUORIDE IN SOME SURFACE AND GROUND WATERS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
For primary bibliographic entry see Field 02K.
W73-12969

4C. Effects on Water of Man's Non-Water Activities

OUTDOOR RECREATION IN THE BALTIMORE AREA.
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06D.
W73-12360

THE LAKEFRONT PLAN OF CHICAGO.
Chicago, Ill.

December 1972. 49 p, 15 fig, 3 tab.

Descriptors: *Planning, *Recreation, Landfill, *Land use, Water quality, aesthetics, Parks, Coordination, *City planning, *Illinois.
Identifiers: *Lakefront development, Development policies, Land use controls, *Chicago.

The Chicago lakefront has been a significant area for recreational and cultural activities and of natural and man-made beauty for over fifty years. Policies and planning concepts for the maintenance and further development of the lakefront areas are presented. A short history of the development of the lakefront which was largely based on landfill projects, a discussion of basic development policies for the lakefront, a graphic presentation of possible planning alternatives for future development which include significant new landfills, and a strategy for implementing the new plans and projects are included. Strategy consists of adopting lakefront policies, conducting further studies and analyses of the area, programming various public improvements, promoting citizen participation, and establishing lakefront controls and ordinances. Some of the development policies relate to improving water quality and ecological balance, preserving cultural and historical heritage, increasing recreational diversity, preventing erosion, improving access, and coordinating public and private development. Numerous colorful maps and photographs are included. (Elfers - North Carolina)
W73-12367

BUFFALO CREEK DAM DISASTER: WHY IT HAPPENED,
Geological Survey, Arlington, Va.
W. E. Davies.
Civil Engineering ASCE, Vol 43, No 7, p 69-72, July 1973. 1 fig, 2 photo.

Descriptors: *Waste dumps, *Dam failure, *West Virginia, *Floods, *Coal mine wastes, Disasters, Foundation failure, Dam design, Soil mechanics.
Identifiers: *Buffalo Creek (W Va).

On February 26, 1972, a large coal refuse bank serving as a dam for a settling pool failed, resulting in a flash flood on Buffalo Creek, West Virginia. 125 persons were killed and $50 million damage was done. The refuse dam was built in 1969 by the Buffalo Mining Company, a subsidiary of Pittston Corporation. The causes of failure were inadequate foundations, lack of zoning and compaction in the structure, inadequate water-level control facilities, and lack of collars and baffles on an overflow pipe allowing water to penetrate deep within the structure. Some of the underlying causes that allowed these conditions to exist were lack of clear-cut laws and regulations at Federal and State levels; failure to enforce the State registration act as it applied to the practice of engineering; lack of planning, zoning, and engineering expertise at the county level; and failure of professions that had demonstrated competency in determining stability of refuse dams to apply their knowledge. (Knapp-USGS)
W73-12411

CALIFORNIA POWER PLANT SITING STUDY: VOLUMES, I, II, AND III.
Holmes and Narver, Inc., Anaheim, Calif.
For primary bibliographic entry see Field 05G.
W73-12574

RIVER CHANNEL CHANGE WITH TIME: AN EXAMPLE,
Geological Survey, Berkeley, Calif.
For primary bibliographic entry see Field 02J.
W73-12590

SEDIMENT RESULTING FROM CONSTRUCTION OF AN INTERSTATE HIGHWAY IN THE PIEDMONT AREA OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
H. E. Reeder.
Open-file report, 1973. 27 p, 12 fig, 3 tab, 2 ref.

Descriptors: *Sediment transport, *Road construction, *Sediment control, *Settling basins, *North Carolina, Technology, Sediments, Particle size, Sedimentation, Erosion control, Vegetation, Methodology.

From July 1971 to August 1972 the U.S. Geological Survey, in cooperation with the North Carolina State Highway Commission, used a small settling basin in conducting a study of sediment runoff resulting from the construction of a segment of Interstate 40 in northwestern Wake County. A settling basin was constructed as part of the highway construction project directly downstream from the highway culverts. The depth of the basin varied from about 3-1/2 to 5 feet. The initial capacity of the basin at the top of the spillway was 720 cubic yards. A 4-inch drop outlet pipe was placed through the dam to provide discharge from the reservoir. Near the peak of a storm on July 31, sediment concentration of the inflow from the waste area was 7,050 mg/liter. At the same time, the concentration was 1,170 mg/liter in the lateral culvert which drains an area where grass cover was well established. The retention capacity of the settling basin was almost depleted, which allowed about 50% of the sediment entering the basin to pass on through the basin. At approximately the same time that inflow samples were collected, concentrations in the spillway and outflow pipe were 2,920 and 2,520 mg/liter, respectively. (Woodard-USGS)
W73-12713

FISHES OF THE BIG SOUTH FORK OF THE CUMBERLAND RIVER,
Tennessee Univ., Knoxville.
C. E. Comiskey, and D. A. Etnier.
J Tenn Acad Sci. Vol 47, No 4, p 140-146, 1972, Illus.
Identifiers: Etheostoma-kennicotti, Etheostoma-sagitta, Fish, Records, River, *Tennessee (Cumberland River), *Fish migration, *Railroad construction.

A recent survey of the fishes of the Big South Fork of the Cumberland River has confirmed the continued presence of 40 of the 50 spp. previously reported from the system. An additional 27 spp. are reported from the system for the first time. Evidence concerning the recent transfer of Etheostoma kennicotti (Putnam) and E. sagitta (Jordan and Swain) from the upper Cumberland River system (above Cumberland Falls) due to railroad grade construction in the vicinity of Stearns, McCreary County, Kentucky, is discussed. Additional comments concern the apparent transfer of a number of species from more westerly tributaries of the Cumberland River into several western tributaries of the Big South Fork in recent times by way of primarily underground drainage systems in Elk Springs Valley, Wayne County, Kentucky.–Copyright 1973, Biological Abstracts, Inc.
W73-12820

4D. Watershed Protection

SIXTEENTH ANNUAL ARIZONA WATERSHED SYMPOSIUM PROCEEDINGS.
Arizona Water Commission, Phoenix.

Symposium held at Phoenix, Arizona, Deptember 20, 1972. Arizona Water Commission Report No. 2 (1972) 43 p.

Descriptors: *Watershed management, *Wildlife habitats, *Aesthetics, Wildlife management, Landscaping, *Arizona, Southwest US.

The watershed's prime role is changing to that of a vast playground while population growth encroaches and reduces the available resource base. Watershed productivity and carrying capacity on remaining lands must be increased to meet these new pressures and demands while sustaining yields of traditional products. Research has shown that watershed management can increase productivity to meet these demands without violating environmental constraints; the papers presented are representative of this research. Topics include wildlife habitat improvement, aesthetics, and landscaping. (See W73-12404 thru W73-12408)
W73-12403

WILDLIFE HABITAT IMPROVEMENT IN RELATION TO WATERSHED MANAGEMENT IN THE SOUTHWEST,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.
H. G. Reynolds.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix, Arizona, (1972) p 10-17. 5 fig, 50 ref.

Descriptors: *Wildlife habitats, *Wildlife management, *Watershed management, *Habitat improvement, *Competing uses, *Arizona, Cost-benefit analysis, Ponderosa pine trees, Pinyon pine trees, Juniper trees, Chaparral, Riparian land, Forest watersheds, Environmental effects.
Identifiers: Beaver Creek Pilot Watershed Project (Ariz.).

The interaction of ecological factors with social constrainst of laws and customs, together with economic limitations of costs vs. benefits, as this interaction bears on wildlife habitat at improvement in conflict with watershed management is discussed. It is desirable to understand how alteration of a vegetation complex by activities such as cutting or burning influences resident wildlife species, so that management practices can be developed compatible with multiple use of watershed. Ponderosa pine, pinyon-juniper, chaparral, and riparian habitats are discussed, with attention given to various means of modifying them to increase water yield. The effectiveness of wildlife habitat management practices depends not only upon detailed ecological knowledge, but its coordination with the needs and objectives of society as tempered by economic limitations. Nevertheless constraints are recommended to improve and enhance wildlife habitat when vegetation is being altered to improve water yield. Not only is it necessary to consider these but their employment will actually create more productive watersheds. (See also W73-12403) Paylore-Arizona)
W73-12404

RESPONSES OD DEER AND ELK TO BEAVER CREEK WATERSHED TREATMENTS,
Arizona Game and Fish Dept., Flagstaff.
D. J. Neff.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix Arizona (1972), p 18-24. 7 fig.

Descriptors: *Wildlife habitats, *Watershed management, *Habitat improvement, *Wildlife management, *Big game, Deer, Forest watersheds, Demonstration watersheds, Ponderosa Pine trees, Juniper trees, Pinyon trees, Oak trees, Clear-cutting, *Arizona.
Identifiers: Pellet group counts, Beaver Creek Pilot Watershed Project (Ariz.), Elk.

Research studies on the Beaver Creek watersheds in central Arizona to observe and evaluate responses of deer and elk to experimental vegetation treatments by pellet group counts show that in pinyon-juniper type habitat treatment plans should be conservative, keeping cleared areas relatively small and well interspersed with standing juniper cover. Productivity of tall brose plants should be protected, as well as highly palatable forbs and half-shrubs. One experimental watershed in the study lost its total forage cover by heavy experimental application of herbicides. In the ponderosa pine type habitat, logging management systems that open up small clear-cut spots or strips in pine forest canopy appear to be generally favorable to deer and elk. Gambel oak provides highly palatable browse and should be given high priority for its wildlife values. Stands of relatively rare tree and shrub species of special wildlife or esthetic value should be given consideration in logging or watershed management plans. Pine stringers that extend down along drainageways into grassland or juniper have great value as travel lanes and feeding areas for big game far out of proportion to the acreage and number of trees involved and should therefore, be given high priority for wildlife habitat. A series of figures for 16 experimental watersheds in the area show mean annual deer use by pellet groups per acre per month on clear cut windrowed, untreated, one-third clear-cut irregular strips, cabled, or felled. (See also W73-12403) (Paylore-Arizona)
W73-12405

A TREATMENT PRESCRIPTION FOR IMPROVING BIG GAME HABITAT IN PONDEROSA PINE FORESTS,
Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station.
W. P. Clary.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, p 25-28. 1 fig, 8 ref.

Descriptors: *Wildlife habitats, *Big game, *Habitat improvement, *Watershed management, Ponderosa pine trees, *Demonstration watersheds, Projections, Forest watersheds, Water yield improvement, Small animals (Mammals), *Arizona.
Identifiers: Beaver Creek Pilot Watershed Project (Ariz.).

Using one of several experimental watersheds on the Beaver Creek watershed, central Arizona, this study will attempt to employ a number of techniques as applied to elk, deer, turkey, carnivores, small rodents, birds, and insects, to determine response to alterations in habitat. The prescription will be related to a series of treatment studies in the ponderosa pine types that include untreated controls, manipulation of timber overstory to increase water yield, livestock grazing to increase water yield, and silvicultural management to improve timber yield. Wildlife evaluations are included in most of these treatment studies. The intent of this particular one is to improve habitat for big game, but a number of constraints are imposed in the prescription to minimize the impact of these management procedures on smaller forms of wildlife. Computer models will be used to determine alternatives for management procedures designed to improve big game habitat, by insuring maintenance of maximum production and availability of wildlife feed without adverse effects on forest products and values. Results of this model will, it is expected, also provide evaluations of the hydrologic performance of the watershed, impact on sediment yields, initial and long-term effects on the timber resource, response of forage species important for both big game and livestock, and esthetic and recreational values of the treatment. (See also W73-12403) (Paylore-Arizona)
W73-12406

THE VISUAL ASPECTS OF RESOURCE MANAGEMENT,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
I. L. Fish.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix, Arizona (1972), p 29-37. 18 fig.

Descriptors: *Aesthetics, *Landscaping, *Scenery, *Land resources, *Watershed management, Environmental effects, Natural resources.
Identifiers: Perception.

The four dominant elements that characterize landscape: form, line, color, and texture, are applied to landscape management, which strives both for the utilitarian aspects of resource management programs as well as the potential visual opportunities of such programs, or, in a word, landscapes by intent, not accident. Temporary changes that constitute retrievable impacts on the visual landscape are differentiated from actions that cause irretrievable loss of non-renewable resources. Three concepts to recognize in dealing the landscape manipulation are its identifiable character, visually acceptable variety, and deviations that can be managed to achieve that variety. Criteria beyond the 4 dominant elements noted above include geological formations, vegetative arrangement or variety, water features (streams, lakes, waterfalls), and the existence of or lack of man's intrusions on the landscape. By following certainprinciples, the potential visual impact on the landscape of any management procedures can be portrayed and predicted in advance of activity. In watershed management programs particularly, the visual quality of the landscape can be controlled to the benefit of all. (See also W73-12403) (Paylore-Arizona)
W73-12407

MEASURING PUBLIC RESPONSES TO VEGETATIVE MANAGEMENT,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
R. S. Boster, and T. C. Daniel.
In: 16th Annual Arizona Watershed Symposium Proceedings, September 20, 1972, Phoenix, Arizona (1972), p 38-43. 5 fig, 1 tab, 9 ref.

Descriptors: *Aesthetics, *Vegetation effects, *Forest management, Public rights, *Landscaping, *Psychological aspects, Demonstration watersheds, Environmental effects, *Arizona.
Identifiers: Perception, Beaver Creek Pilot Watershed Project (Ariz.).

A set of criteria is presented that might be used to judge techniques designed to quantify scenic beauty, a new approach based on a systematic conceptual model supported by some recent research results from Arizona timberlands is described, and then the advantages of this approach are discussed in the context of the criteria. Criteria are that they be conducive to public involvement, independent of the tastes and preferences of the developers of the techniques, and statistically and mathematically unbiased; theoretically sound; capable of handling adequately uncertainties of judgments; easy to use, relatively inexpensive, valid, reliable, etc. Data from 6 Arizona ponderosa pine watersheds were used, of which 5 represented a wide array of vegetative manipulations. Using the Theory of Signal Detection methodology, various groups were tested by means of randomized sequences of slides to determine if the subjects

ould consistently detect vegetative treatments. he TSD provides a means of achieving unbiased erceptual indices, is easy to use, fairly inexpen- ive, and provides more than simple ordinal infor- nation. This method of analysis ensures that out- uts are unbiased by judgmental criteria, and that ie perceived value is separated from standards. s use is recommended in environmental design. See also W73-12403) (Paylore-Arizona)
/73-12408

INAL ENVIRONMENTAL STATEMENT: MALL BEACH EROSION CONTROL PRO- ECT, BROADKILL BEACH, DELAWARE.
rmy Engineer District, Philadelphia, Pa.
or primary bibliographic entry see Field 08B.
/73-12430

TONE AND WOODCHIP MULCHES FOR ROSION CONTROL ON CONSTRUCTION ITES,
gricultural Research Service, Lafayette, Ind.
. D. Meyer, C. B. Johnson, and G. R. Foster.
ournal of Soil and Water Conservation, Vol 27, o 6, p 264-269, Nov-Dec 1972. 4 fig, 4 tab, 12 ref.

escriptors: *Mulching, *Erosion control, *Slope abilization, Soil conservation, *Vegetation tablishment, Erosion, Construction, Slopes, ood wastes, Grasses, Bank stabilization, *Slope otection, Soil stabilization, Soil erosion, Sites, ank protection, Construction materials.
dentifiers: *Mulches, Straw, Cut slopes, Con- ruction practices, Construction methods.

n erosion study was conducted to compare everal materials for use as mulches to control soil osion on construction slopes. Crushed stone, avel, and woodchip mulches showed great otential for erosion control on steep denuded opes, especially where conventional methods ight have been unsatisfactory. The effectiveness f the mulches in stabilizing the soil surface was a nction of surface cover and mulch stability. lulches costing much less than sodding were tisfactory slope stabilizers. Types and rates ited for different conditions are summarized. or 20% slopes tested, 100 to 200 tons/acre of one or gravel or 15 to 25 tons/acre of woodchips ovided excellent soil stabilization at reasonable st on slope lengths up to about 150 ft. These sults suggest that many construction slopes can e stabilized permanently immediately after they e shaped, and at reasonable cost. (USBR)
/73-12463

TANDARDS FOR SOIL EROSION AND SEDI- ENT CONTROL IN NEW JERSEY.
or primary bibliographic entry see Field 02J.
/73-12956

HANNEL EROSION SURVEYS ALONG ROPOSED TAPS ROUTE, ALASKA, JULY /71,
eological Survey, Anchorage, Alaska.
or primary bibliographic entry see Field 02J.
/73-12957

5. WATER QUALITY MANAGEMENT AND PROTECTION

A. Identification of Pollutants

NITROGEN CORRECTION FOR CALORIC ALUES,
msterdam Univ. (Netherlands). Lab. of Animal hysiology.
. Kersting.
imnology and Oceanography, Vol 17, No 4, p 3-644, 1972. 11 ref.

Descriptors: *Analytical techniques, *Nitrogen, *Productivity, Metabolism, Ammonia, Oxidation, Calibrations, Measurement.
Identifiers: *Calorimetry, Oxygen bomb calorimeter.

In production studies the oxygen bomb calorimeter has become an important tool. The fact that the reaction product of nitrogen compounds in the bomb differs from the biological reaction product is of concern to ecologists. In many aquatic organisms the main end product of nitrogen metabolism is ammonia; in oxygen bombs, however, the nitrogen is oxidized further. The extra energy obtained in this way has no biological meaning and a correction should be made accordingly. To compute this correction the end product of the nitrogen oxidation process in the bomb must be known. Determination of nitrates after the combustion of Daphnia magna in the Parr semimicro bomb gave results suggesting that when D. magna is bombed, the nitrogenous end product is, as would be generally expected, primarily N2. If so, a correction has to made for the reaction by which ammonia is oxidized to N2; the necessary energy can be calculated from the standard heats of formation. This correction is important, especially if caloric values of organisms with different nitrogen contents are compared. (Jones-Wisconsin)
W73-12383

AQUEOUS IRON-SULFUR SYSTEMS IN RICE FIELD SOILS OF LOUISIANA,
Alabama Univ., Birmingham. Inst. of Dental Research.
For primary bibliographic entry see Field 03F.
W73-12385

ALGAL BIOASSAYS: EXAMPLES, ADVANTAGES, AND LIMITATIONS OF CURRENT APPROACHES,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
For primary bibliographic entry see Field 05C.
W73-12400

PCBS AND DDT,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
For primary bibliographic entry see Field 05C.
W73-12402

THE EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
K. J. Guter, and W. J. Cooper.
Available from NTIS, Springfield, Va. 22151 as AD-752 440 - Price $3.00 printed copy; $1.45 microfiche. Report No 73-03, October 1972. 59 p, 7 fig, 23 tab, 31 ref, 5 append.

Descriptors: *Water analysis, *Chlorine, *Analytical techniques, Correlation analysis, Reviews, Evaluation, Chemical analysis, Aqueous solutions, Chlorination, Water treatment.
Identifiers: *Chlorine test kits.

An evaluation of five commercial test kit procedures which measure free available chlorine was conducted on both synthetic water (chemically treated distilled water) and five natural waters. Synthetic water samples were used to evaluate parameters influenced by temperature and pH. The ability of test kit procedures to differentiate free available chlorine from other previously reported chlorine test interfering ions, Mn and NO2, and the compounds monochloramine and dichloramine were also studied. The primary objective of the natural water studies was to evaluate the test kit procedures on a variety of natural waters that could be encountered around the world. Accuracy, precision and specificity for free available chlorine were evaluated with the natural water samples. The results led to a recommendation that procedural modifications be attempted in order to increase the specificity of the N,N-diethyl-p-phenylene diamine procedure and to improve the accuracy of the Syringaldazine (liquid) procedure, without adversely affecting their other qualities. (Woodard-USGS)
W73-12426

A TOPOLOGICALLY OPTIMUM RIVER SAMPLING PLAN FOR SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12498

TRITIUM MEASUREMENT OF NATURAL WATERS ON OAHU, HAWAII: A PRELIMINARY INTERPRETATION (SAMPLING PERIOD: JULY 1969 TO JUNE 1970),
Hawaii Univ., Honolulu. Water Resources Research Center.
L. S. Lau, and T. H. Hufen.
Available from the National Technical Information Service as PB-222 279, $3.00 in paper copy, $1.45 in microfiche. Technical Report No. 65, May 1973. 39 p, 11 fig, 3 tab, 15 ref, 2 append. OWRR A-021-HI (1).

Descriptors: *Tritium, *Hawaii, Precipitation (Atmospheric), Surface waters, Groundwater, Isotopes, Measurement, Data collections, Data analysis.
Identifiers: *Oahu (Hawaii).

Water samples collected from various surface and sub-surface sources on the island of Oahu were analyzed for tritium levels. Tritium activity levels in twenty-five monthly rainwater samples show a seasonal dependence with a maximum in the summer (18.5 to 23 TU) and a minimum in the winter (12 TU). Samples from two surface-water reservoirs had activities of 13.2 and 19.7 TU reflecting contemporary rainwater which is their major source of recharge. Four streams in the Pearl Harbor area showed 'rainwater' tritium levels when sampled at high flow. At low flow, two of the streams had low tritium levels indicating ground-water discharge into the stream, while the tritium activity of the other two streams was comparable to rainwater. Tritium activity higher than that of contemporary rainwater (22-38 TU) was exhibited by samples from two springs which discharge perched water, while samples from three wells and two shafts in the Honolulu area showed very little or no tritium activity. Multiple-depth samples obtained from wells in the Pearl Harbor area showed correlations between tritium activities, depths of sampling, and chloride concentrations.
W73-12499

USE OF COLIPHAGES AS INDICATORS OF WATER POLLUTION,
New York Univ., N.Y. Dept. of Biology.
M. C. Hilton, and G. Stotzky.
Canadian Journal of Microbiology, Vol 19, No 6, p 747-751, June 1973. 2 fig, 2 tab, 15 ref.

Descriptors: *Water pollution sources, *Sewage, *Bacteriophage, *Bioindicators, Indicators, Parasitism, Bacteria, Coliforms, Municipal wastes, Hudson River, New York, Aquatic life, Bioassay, Water analysis, Pollutants, Testing procedures, Sampling, Rivers, Running waters, Sewage bacteria, Feasibility studies, *Pollutant identification.

The feasibility of using coliphages, obligate parasites of coliform bacteria, as indicators of water pollution by sewage was investigated. No consistent relationship was found between concentrations of coliform bacteria and coliphages in

samples from the Hudson River on the lower west side of Manhattan, New York. The results indicated, however, that a modification of the enrichment method for the detection of phages in soils and sewage could be used for detecting low levels of phages active against specific host bacteria. (Brown-IPC)
W73-12525

THE PROBLEM OF COLOR MEASUREMENT FOR PULP MANUFACTURING EFFLUENTS (LE PROBLEME DE LA MESURE DE COULEUR DES EFFLUENTS DE FABRICATION DES PATES),
Centre Technique de l'Industrie des Papeirs, Cartons et Celluloses, Grenoble (France).
For primary bibliographic entry see Field 05G.
W73-12526

PITFALLS AND PROCEDURES IN BOD TESTS,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
W. E. Razzell.
Pulp and Paper Magazine of Canada, Vol 73, No 7, p 86-89 (p T186-189), July, 1972. 6 fig, 9 ref.

Descriptors: *Biochemical oxygen demand, *Pulp wastes, *Analytical techniques, Testing procedures, Water analysis, Waste waters (Pollution), Bioassay, Chemical analysis, Organic loading, Microorganisms, *Reviews.

A review of the literature on determinations of the BOD of diverse organic chemicals and of pulp mill wastes emphasizes the crucial importance of properly acclimated seed (i.e., mixed microbial flora) for successful short-term test results. Seed acclimation, leading to increased BOD values, avoids results which underestimate the chemical load of wastes and which could be refuted by additional tests with a more active seed. The use of BOD as a measure of waste discharges places a heavy burden on the analyst and requires an accumulation of data far beyond the routine analyses themselves. (Brown-IPC)
W73-12527

SETTLEABLE MATTER IN WASTE WATER. SCAN-W7:72.
Scandinavian Pulp, Paper and Board Testing Committee, Stockholm (Sweden).

Paperi ja Puu (Papper och Tra), Vol 54, No 1, p 11-12, January, 1972; reprinted in Norsk Skogindustri, Vol 26, No 2, p 47-48, February, 1972; and Svensk Papperstidning, Vol 75, No 4, p 143, February 29, 1972.

Descriptors: *Waste waters (Pollution), *Suspended solids, *Water analysis, Analytical techniques, Standards, Foreign countries, Europe, Pulp wastes.
Identifiers: *Scandinavia.

In this Scandinavian standard method for waste water characterization, a known volume of the shaken sample is allowed to settle, generally for 30 min, whereupon the supernatant is rfemoved by suction, and the remainder is filtered. The solid matter thus obtained is dried and weighed. Details of the procedure are given. (Brown-IPC)
W73-12530

DETERMINATION OF ORGANIC SUBSTANCES IN INDUSTRIAL EFFLUENTS (NEKTERE MOZNOSTI STANOVENI ORGANICKEHO ZNECISTENI ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia).
S. Pokorny.
Papir a Celuloza (Prague), Vol 27, No 1, p 3-4, 12, 1972. 2 tab, 18 ref.

Descriptors: *Water analysis, *Pollutant identification, Waste waters (Pollution), Industrial wastes, Reviews, Testing procedures, Analytical techniques, Effluents, Pulp and paper industry, *Biochemical oxygen demand, Chemical oxygen demand, *Pulp wastes, Oxygen demand, Foreign research, Europe, Chemical analysis, Organic compounds.
Identifiers: *Czechoslovakia.

Various methods are outlined for the analytical determination of organic compounds in aqueous industrial wastes, especially pulp and paper mill effluents. Among determinations of biochemical oxygen demand, the classical five-day and respirometric procedures are compared. In measuring chemical oxygen demand by means of potassium permanganate or dichromate, a modified method developed specifically for use in the pulp and paper industry is discussed. (Trubacek-IPC)
W73-12532

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from Institute of Paper Chemistry, Appleton, Wis., ($12.00), Bibliographic Series, No 252, 1972. 124 p, 394 ref.

Descriptors: *Water pollution, *Pulp and paper industry, *Bibliographies, *Testing procedures, *Monitoring, Water quality, Streams, Running waters, Chemical oxygen demand, Biochemical oxygen demand, Bioassay, Effluents, Industrial wastes, Pulp wastes, Pollutants, *Analytical techniques, Water analysis.

This second part of a six-part annotated and indexed bibliography deals with chemical and biochemical analytical and test methods for the identification and determination of pollutants in the aqueous effluent streams of pulp, paper, and board mills, as well as with the monitoring of water quality, the measurement of chemical and biochemical oxygen demand, and various bioassay procedures. The literature cited spans the publication period from about 1950 to 1970. (See also W73-12553). (Brown-IPC)
W73-12554

ENVIRONMENTAL IMPACT STUDY.
Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
For primary bibliographic entry see Field 05G.
W73-12580

LEAD POLLUTION: RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-12589

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.

Data Report No 32, 1973. 31 p.

Descriptors: *Water analysis, *Water quality, *Chemical analysis, *Chesapeake Bay, Sampling, Analytical techniques, Inorganic compounds, Organic compounds, Water chemistry, Nutrients, Water temperature, Hydrogen ion concentration, Coliforms, Data collections, Sewage effluents, Pollutant identification, Water pollution sources.
Identifiers: *Upper Chesapeake Bay.

During the years 1967-71, various special surveys were conducted of the upper Chesapeake Bay and a number of its tributaries. The results of these investigations are presented. Bush River, Romney Creek, Spesutie Narrows and Swan Creek investigations have continued to determine the effects of the new Sod Run treatment plant on water quality and eutrophication. In the Chesapeake and Delaware Canal, studies were made of the effects of freshwater diversion from the Susquehanna River while work on the C and D Canal enlargement continued. Other studies were conducted on the Chester, Severn, Gunpowder, Middle, and Bird Rivers. Analytical methods and results are presented for the following parameters: water temperatures, light extinction, pH, conductivity, salinity, total phosphorus, inorganic phosphorus, total Kjeldahl nitrogen, nitrate + nitrite, ammonia, dissolved oxygen, biochemical oxygen demand, total organic carbon, total carbon, chlorophyll a, coliform, fecal coliform, and metals in solution. (Woodard-USGS)
W73-12601

HEAVY METALS IN THE ENVIRONMENT.
For primary bibliographic entry see Field 05B.
W73-12604

PROBLEMS IN THE ANALYSIS OF TRACE METALS,
Washington State Univ., Pullman. Nuclear Radiation Center.
R. H. Filby.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 59-79, January 1973. 16 tab, 18 ref.

Descriptors: *Pollutant identification, *Trace elements, *Chemical analysis, *Analytical techniques, Instrumentation, Sampling, Mass spectrometry, Polarographic analysis, Spectroscopy, Spectrophotometry, Heavy metals.

Trace element analysis is now a separate area of analytical chemistry, and many of the problems encountered are peculiar to the chemistry of very low concentrations. In the 1930's emission spectrography was used extensively for the determination of trace elements in many materials, and although the method proved to be a convenient and sensitive technique for many elements, it has been largely supplanted today by more precise and sensitive analytical methods. Some of the more important analytical methods in use today, and problems that may be encountered in determination of trace elements in environmental materials are summarized. Sample collection and chemical separation techniques are emphasized. (See also W73-12604) (Woodard-USGS)
W73-12608

TRANSPORT OF HEAVY METALS THROUGH THE AIR ENVIRONMENT,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 05B.
W73-12609

VARIABLE SAMPLING FREQUENCY - A NEW ADAPTIVE TECHNIQUE,
For primary bibliographic entry see Field 07B.
W73-12616

HEATED SENSORS FOR FLOW MEASUREMENTS,
For primary bibliographic entry see Field 07B.
W73-12618

FACTORS INFLUENCING DETECTION OF SALMONELLAE IN RENDERED ANIMAL BY--PRODUCTS,
Swift and Co., Oak Brook, Ill. Research and Development Center.
R. B. Tompkin, and T. V. Kueper.
Applied Microbiology, Vol 25, No 4, p 485-487, April 1973. 3 tab, 9 ref.

Descriptors: *Pollutant identification, Cultures, Feeds.
Identifiers: *Animal by-products, Enrichment, Culture media, Sample size.

The purpose was to develop a better understanding of the factors, such as enrichment and plating media and quantity of product tested, which influence the detection of salmonellae in naturally contaminated animal by-products. Two samples were analyzed for Salmonella, one with selenite-cystine broth and one by tetrathionate-Brilliant Green-iodine broth, both containing Tergitol No. 7. The enrichment broths were streaded onto plates of Brilliant Green-sulfa agar and Salmonella-Shigella agar. Salmonella-like structures were picked to triple sugar iron agar slants and tested serologically. The results confirm that a linear relationship exists between total plate counts and the detection of salmonellae in animal by-products in the total count range of 10,000 to 10,000,000 per gram. (Little-Battelle)
W73-12619

DEGRADATION OF METHYLMERCURY BY BACTERIA ISOLATED FROM ENVIRONMENTAL SAMPLES,
Midwest Research Inst. Kansas City, Mo.
W. J. Spangler, J. L. Spigarelli, J. M. Rose, R. S. Flippin, and H. H. Miller.
Applied Microbiology, Vol 25, No 4, p 488-493, April 1973, 1 fig, 5 tab, 7 ref.

Descriptors: *Microbial degradation, *Lake sediments, *Aquatic bacteria, *Aerobic conditions, *Anaerobic conditions, *Freshwater fish, Volatility, Radioactivity techniques, Biodegradation, Cultures, Isolation, Chemical analysis, Aquatic environment, Mercury, Heavy metals, Sampling, Methane.
Identifiers: *Methylmercury, *Demethylation, *Fate of pollutants, Biological magnification, Environmental samples, Lake St. Clair, Organomercury compounds, Electron capture gas chromatography, Flame ionization gas chromatography, Methylmercury iodide, Mercury radioisotopes, Hg-203, Methylmercury bromide.

In order to investigate the possibility that organisms capable of degrading methylmercury are present in the aquatic environment, 207 organisms which were isolated from sediments and fish were screened for demethylation of methylmercury bromide (MMB). Fish and sediment samples were also analyzed for total mercury and methylmercury. Each organisms to be tested for aerobic degradation was grown through 2 transfers in shaker flasks containing tryptic soy broth (TSB) without inorganic Hg or methylmercury. Hg-203-labeled MMB was added and each flask was connected to an HgBr sub 2-KBr trap containing a trapping solution to scavenge any inorganic Hg or organomercurials volatilized from the flask. Head gases were flushed to traps with a stream or vapor-saturated, sterile air. For anaerobic demethylation, 0 sub 2-free N sub 2 was used as the flushing gas, and 0.025 percent cysteine was added to the TSB. The trapped gas was monitored with a gamma scintillation spectrometer; methane in head gases was analyzed by flame ionization GC. Traps and flask contents were analyzed for MMB after extraction whereby methylmercury iodide was determined in benzene extracts by electron capture gas chromatography. Of the 207 bacterial cultures, 30 were found positive for aerobic demethylation. Twenty-two were shown to be facultative anaerobes and 21 degraded methylmercury anaerobically. All positive species volatilized methylmercury aerobically, and methane was produced as a degradation product. Although methylmercury degradation was complete in most cases, material balances indicated some of the inorganic mercury formed was not volatilized and is presumed bound to the cells. All positive isolates were tolerant to at least 0.5 microgram of methylmercury per ml, and the extent of volatilization of mercury increased with concentration to the threshold value. The results indicate that demethylating species are prevalent in the environment and may be important in suppressing the methylmercury content of sediments. (Holoman-Battelle)
W73-12620

SELECTIVE SUBSTRATE UTILIZATION BY MARINE HYDROCARBONOCLASTIC BACTERIA,
Naval Weapons Center, China Lake, Calif. Michelson Labs.
For primary bibliographic entry see Field 05B.
W73-12621

PREPARATION AND PROPERTIES OF 3--TRIFLUOROMETHYL-4-AMINOPHENOL,
Medical College of Wisconsin, Milwaukee. Dept. of Pharmacology.
For primary bibliographic entry see Field 05B.
W73-12622

THE ZOOPLANKTON OF THE GULF OF GUINEA,
V. Bainbridge.
Bulletins of Marine Ecology, Vol 8, No 1, p 61-97, September 1972. 13 fig, 7 tab, 72 ref.

Descriptors: *Zooplankton, *Sampling, *Atlantic Ocean, *Distribution patterns, *Migration patterns, Upwelling, Copepods, Vertical migration, Water temperature, Salinity, Diurnal distribution, Diel migration, Spatial distribution, Temporal distribution, Biorhythms, Africa.
Identifiers: *Species diversity, Sample preservation, Gulf of Guinea, Nigeria, Ghana, Cameroun, Senegal, Sierra Leone, Macroinvertebrates, Paracalanus spp., Eucalanus pileatus, Oncaea spp., Temora spp., Centropages spp., Oithona spp., Macrosetella spp., Corycaeus spp., Corycella garcillis, Acartia danae, Calocalanus spp., Undinula vulgaris, Copilia mirabilis.

The quantity and composition of the zooplankton in the coastal waters of tropical West Africa and its variability in relation to the hydrographic climate of the region are discussed. Three series of zooplankton collections were used: (a) samples taken with closing nets near the edge of the shelf off Guinea in October, 1956 and off Nigeria in 1961 and 1962 to investigate vertical distributions and migrations; (b) samples collected from July 1961 to July 1962 at the stations of a monitoring oceanographic transect off Lagos, Nigeria, to study the annual cycle of zooplankton; and (c) samples collected in 1952 during extensive fishery surveys along the West African shelf between Cape Verde and Fernando Po. All collections were preserved in 5 percent formaldehyde made up in filtered sea water and neutralized with borax. The results of the plankton analyses were considered in terms of community diversity and trophic structure. Zooplankton showed a marked discontinuity at the thermocline. Off Lagos in 1961 and 1962, quantities of zooplankton within the upper 30 m were normally low, showing a gradual transition from neritic to an oceanic fauna with increasing distance from the coast. During a weak upwelling in August and September, zooplankton volumes over the shelf increased fourfold or more. Two copepods, Calanoides carinatus and Eucalanus monachus, both relatively rare over the shelf during stable conditions, became abundant in the surface waters. During the upwelling, the faunal diversity declined and the percentage of carnivores in the population fell below the usual 20-40 percent level. Extensive surveys have confirmed the great ecological importance and frequent dominance of the copepod Calanoides carinatus during the localized upwellings off Ghana and Senegal where it would appear to be one of the main exploiters of the accompanying diatom blooms. The relevance of these studies to some well known concepts regarding speciation in tropical environments is discussed. The key factor leading to the usually highly diverse zooplankton appears to be relative stability of the environment. (Little-Battelle)
W73-12623

A STUDY OF INORGANIC SALTS REQUIREMENTS AND EFFECT ON THE MORPHOLOGY OF MARINE BACTERIA,
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-12628

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
E. F. Yost.
Available from the National Technical Information Service as N73-15346, $3.75 in paper copy, $1.45 in microfiche. Report Nos TR-20-1, NASA-CR-129936, December 1972. 47 p, 20 fig, 9 tab, 1 ref, append. Contract No NAS5-21792.

Descriptors: *Remote sensing, *Phytoplankton, *Water analysis, *Coasts, Water temperature, Salinity, Dissolved oxygen, Nutrients, Suspended solids, Optical properties, Chlorophyll, Silica, Pollutant identification, Phosphates, Nitrates, Nitrites, Organic matter, Aerial photography.
Identifiers: *Ground truth, Data interpretation, Chlorophyll a, Chlorophyll c, Block Island Sound, Multispectral photography.

The synoptic repetitive coverage of the multispectral imagery from the ERTS satellite, when photographically reprocessed using the state-of-the-art techniques, has given indication of spectral differences in Block Island and adjacent New England waters which were heretofore unknown. Of particular interest was the possible detection of relatively small amounts of phytoplankton prior to the occurrence of the red tide in Massachusetts waters. Preparation of spatial and temporal hydrographic charts using ERTS imagery and ground truth analysis should facilitate determining the environmental impact of New York coastal waters. Ground truths will be established by analyzing water samples for temperature, salinity, oxygen, nutrients, pigments, organics, phytoplankton, and optical properties. (Little-Battelle)
W73-12629

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
W. Egan.
Available from the National Technical Information Service as AD-754 009, $3.00 in paper copy, $1.45 in microfiche. Report No RM-561J, December 1972. 72 p, 13 fig, 7 tab, 9 ref.

Descriptors: *Water quality, *Remote sensing, *Aerial photography, *Aircraft, Sewage effluents, Sediments, Photometry, Virgin Islands, On-site investigations, Environmental effects, Pollutants, Thermal pollution, Water cooling, Chemical analysis, Water analysis, Ocean circulation, Optical properties, Turbidity, Dredging.
Identifiers: *Sensors, *Data interpretation, ERTS-A sensors, Multispectral sensing system.

The harbor at Charlotte Amalie on St. Thomas, Virgin Islands, has a concentration of many factors affecting water quality: untreated sewage effluent, sediment from navigation and dredging operations, runoff from a garbage dump, and hot effluent from a desalination/power plant. Imagery from ERTS-A in association with aircraft imagery and ground truthing permits the characterization of water quality in terms of absolute color values. This necessitates the establishment of photometric standards resolvable by the ERTS-A sensors in order that atmospheric effects, which generally vary on sequential overpasses, may be determined and subtracted. The overall program is described together with typical numerical results. (Holoman-Battelle)
W73-12630

FOULING ON EELGRASS (ZOSTERA MARINA L.),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05G.
W73-12631

THE CRAYFISH, ORCONECTES VIRILIS, AS AN INDICATOR OF MERCURY CONTAMINATION,
Canadian Wildlife Service, Edmonton (Alberta).
K. Vermeer.
Can Field Nat. Vol 86, No 2, p 123-125. 1972. Illus.
Identifiers: *Crayfish, *Indicators, *Mercury contamination, Orconectes-Virilis.

The crayfish, O. virilis, is a good indicator of mercury contamination in different water bodies. Crayfish muscle contained 3 times as much Hg as the remaining body. Hg levels did not differ significantly in samples collected from various parts of the shore of a highly contaminated lake.--Copyright 1973, Biological, Abstracts, Inc.
W73-12632

CONCENTRATION OF FLUORINE IN POTABLE WATER IN BIHAR PLATEAU: A PRELIMINARY SURVEY,
Indian Veterinary Research Inst., Izatnagar.
P. N. Johri, C. N. Singh, and J. P. Srivastava.
Indian J Anim Sci. Vol 41, No 6, p 452-455. 1971.
Identifiers: *Fluorine, *India (Bihar plateau), Plateau, *Potable water, Survey.

F-Concentration was estimated in 152 water samples collected from various sources. The F content of well water varied within the same village and was generally higher than other sources. Its concentration in water was higher in late winter than in rainy season. F in toxic levels was found in water samples of Ranchi, Hazaribagh and Palamau districts, India.--Copyright 1973, Biological Abstracts, Inc.
W73-12645

IDENTIFICATION AND MEASUREMENT OF ENVIRONMENTAL POLLUTANTS. SYMPOSIUM.

Ottawa, Ontario, Canada, June 14-17, 1971. National Research Council: Canada. 1971. 451 p. Illus. Maps.
Identifiers: Animals, Books, Chromatography, *Environmental pollutants, *Measurement, Pollutants, Symposium, *Pollutant identification.

This symposium was concerned with securing, devising, testing and adopting uniform, precise and accurate methods of analysis and to give official sanction to those techniques and procedures found acceptable for the identification and measurement of pollutants. All the invited symposium papers as well as the plenary lectures are presented. The first group of papers discuss the following: the need for environmental monitoring; evaluation of S and Se compounds as air pollutants; permeation tubes as primary gaseous standards; soil-pesticide interactions; and pesticide metabolism in animals. The next group of papers covers the following topics: analytical and organoleptic measurement of odors from animal wastes; determination of polychlorinated biphenyls in environmental samples; the problem of contaminants in human food; some recent developments in the chromatographic determination of multicomponent pesticide residues; and remote sensing techniques for oil slick measurements. The next section contains papers on the following topics: carbon analysis in pollution abatement; identification and measurement of trace elements in freshwater by neutron activation; P compounds in natural waters; and differentiation of chemical states of toxic species, especially cyanide and Cu, in water. The final group of papers describes the following related topics: tracer cosmos, a realistic concept in pollution analysis; monitoring of radioactive isotopes in environmental materials;fluoride in the environment; and man's reaction to his acoustical environment.--Copyright 1973, Biological Abstracts, Inc.
W73-12655

DETERMINATION OF MELAMINE-FORMALDEHYDE RESIN IN WHITE WATERS (OPREDELENIE SODERZHANIYA MELAMINO-FORMALDEGIDNOI SMOLY V PODSETOCHNYKH VODAKH),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Pravdinski (USSR).
G. B. Shtreis, M. V. Frolov, and Yu. G. Polikanov.
Bumazhnaya Promyshlennost, No 1, p 26, January, 1972. 1 fig, 2 tab.

Descriptors: *Water analysis, *Resins, *Pulp wastes, *Waste water (Pollution), Effluents, Testing procedures, Analytical techniques, Pollutants, Pulp and paper industry, Ultraviolet radiation, Spectrophotometry, Nitrogen compounds, Polymers, Additives, Retention, Chemical analysis.
Identifiers: *Melamine resins, Synthetic polymers, White water, Cellulose fibers, Melamine, Formaldehyde, Chemical retention, Pulp additives, Chemical consumption.

The efficiency of retention of melamine-formaldehyde resins by pulp fibers affects not only the sizing quality and wet strength of paper, but also the amounts lost in the paper machine waste water (white water) and thus the pollution load of the sewered effluent. A convenient and rapid procedure for determining resin retention is described. It is based on the absorption of ultraviolet light at 243 nm by the resin, followed by calculation of resin concentration in the white water. It gives analytical results which agree with those obtained by the more time-consuming Kjeldahl method to within plus or minus 5 per cent. (Stapinski-IPC)
W73-12672

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
For primary bibliographic entry see Field 04B.
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12719

WATER QUALITY IN THE MIDDLE FORK FEATHER RIVER, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif. Water Resources Div.
A. E. Dong, and R. L. Tobin.
Open-file report, February 22, 1973. 55 p, 8 fig, 5 tab, 13 ref, 6 append.

Descriptors: *Water quality, *Wild rivers, *California, *Chemical analysis, Scenery, Rivers, Recreation, Sampling, Streamflow, Flow rates, Gaging stations, Baseline studies, Biota, On-site investigations, Laboratory tests, Data collections, Evaluation.
Identifiers: *Middle Fork Feather River (Calif).

A 69-mile reach of Middle Fork Feather River, California, has been designated as part of the National Wild and Scenic Rivers System. A multiagency water sampling and analysis program was undertaken to establish the quality of water in the river. Discharge in the river fluctuates in an annual pattern, high in winter and spring, low in summer, with wide differences from year to year. Water samples were collected at four gaging stations at monthly intervals to demonstrate diurnal fluctuations. Samples were collected at 37 sites along the reach to provide profiles of water quality at several times during the study. Samples were selectively analyzed in the field or in the laboratory for temperature, dissolved oxygen, specific conductance, pH, alkalinity, coliform bacteria, BOD, TOC, MBAS, color, nitrogen and phosphorus in various forms, sulfate, chloride, dissolved solids, turbidity, and suspended sediment. Water in Middle Fork Feather River is of good quality and meets most of the criteria for freshwater biota and recreational purposes. Water quality is poorest at the upstream end near Portola, and quality improves in the downstream direction, probably due to dilution by better quality water from tributaries. (Woodard-USGS)
W73-12720

PH-SENSITIVE FLUOROGENIC SPRAY REAGENTS: II. QUANTITATIVE STUDIES WITH PESTICIDES,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
R. W. Frei, and P. E. Belliveau.
Chromatographia. Vol 5, No 5, p 296-300. 1972. Illus.
Identifiers: Fluorogenic, *Pesticides, Quantitative methods, Spray reagents (Fluorometric), Hydrogen ion concentration.

A new spray using DDQ (1,2-dichloro-4,5-dicyanobenzoquinone) for the in situ fluorometric detection of sulfur-containing pesticides on thin-layer chromatograms was studied in order to evaluate the quantitative potential of the method. The effects of pH, various adsorbents, spray solvents and concentrations, U.V. irradiation and time on the fluorescent intensity of the spots were investigated and the optimum conditions were established. An average reproducibility of 5% relative standard deviation and an average detection limit of 0.05microgram/spot were obtained. Linear calibration curves up to 5 microgram/spot and extending through the point of origin were observed. This method was used successfully to analyze a natural water sample containing 2 ppb of malathion.--Copyright 1973, Biological Abstracts, Inc.
W73-12727

AUGER SOIL SAMPLER FOR HERBICIDE RESIDUES,
Agricultural Research Service, College Station, Tex. Plant Science Research Div.
For primary bibliographic entry see Field 02G.
W73-12794

IMULTANEOUS DETECTION OF THE ESIDUES OF ATRAZINE AND LINURON IN VATER, SOIL, PLANT, AND ANIMAL SAM-LES BY THIN-LAYER CHROMATOGRAPHY,
epartment of Agriculture, Ottawa (Ontario). hemistry and Biology Research Inst.
. Purkayastha.
t J Environ Anal Chem. Vol 1, No 2, p 147-158, 971, Illus.
lentifiers: *Atrazine, *Chromatography (Thin yer), Corn-M, *Herbicides, *Linuron, Residues, amples, Soils.

he s-triazine and substituted urea herbicides are viewed briefly, with particular reference to their xtraction, clean-up, separation by thin-layer romatography (TLC), and detection. A number TLC systems were found for the complete paration of atrazine from linuron. On the chro-atoplate both the silver nitrate spray followed by V-irradiation, and the tert-butyl hypochlorites pray followed by iodidestarch can detect the her-cides in the submicrogram range. Under these xperimental conditions acetonitril was the most seful extracting solvent. A detailed procedure for e simultaneous detection of atrazine and of linu-n by TLC is given, which is applicable to sam-es of egg, blood, muscle, liver, corn plant, icken feed, milk, soil, and water. The method is nsitive to 0.1 ppm or even lower with ap-opriate clean-up procedures. The thoroughness the clean-up necessary depends on the nature of e sample. For this purpose, hexane partitioning, d chromatography on polyethylene-coated alu-ina, alumina, and Florisil have been used chiefly. ecovery of the 2 herbicides, using the above rocedure, ranged from 80-92%.--Copyright 1972, iological Abstracts, Inc.
73-12811

ERCURY LEVELS IN WISCONSIN FISH AND VILDLIFE,
isconsin Dept. of Natural Resources, Madison.
J. Kleinert, and P. E. Degurse.
is Dep Nat Resour Tech Bull. 52, p 1-22, 1972, us.
entifiers: Deer, Duck, *Fish, Goose, Grebe, eron, *Mercury, Pheasant, Rabbit, Ruffed ouse, Squirrel, Swan, *Wildlife, *Wisconsin.

ercury determinations were made on 1824 fish let samples representing 139 locations covering of Wisconsin's 72 counties and boundary aters of Lake Michigan, Green Bay, Lake Su-erior, and the Mississippi River. All Wisconsin sh analyzed contained some Hg, and those from aters removed from any known source of Hg use veraged .19 ppm and ranged between .01-.60 ppm g. The highest levels, averaging about 1 ppm and nging between .10-4.89 ppm, occurred in fish ken from sections of the Chippewa, Flambeau d Wisconsin Rivers located below paper mills d below a Hg cell chlorine-caustic soda plant. ifferent species vary in Hg content, and the rger fish often contain higher concentrations an do smaller fish of the same species taken om the same water. Fish samples taken from the llowing areas contained Hg levels averaging ove the .5 ppm guideline established by the od and Drug Administration for banning fish om interstate markets: the 350-mile stretch of the isconsin River below Rhinelander, 40 miles of e Flambeau River between Cedar Rapids and the nction with the Chippewa River, and 50 miles of e Chippewa River from the junction with the ambeau River to Eau Claire. Hg determinations ere made on 234 wildlife muscle samples and 220 ildlife liver samples. The common game species ere sampled including deer, rabbits, squirrels, ffed grouse, pheasants, puddle ducks, diving cks and geese. Swans, pied-bill grebes and blue rons were also sampled. Hg levels of most isconsin wildlife was well below .5 ppm. Water rds, including waterfowl, contained more Hg an mammals or upland game birds. Livers of div-g ducks, herons, and grebes approached or ex-ceeded .5 ppm. No geographic locations were noted where Hg seemed to be more concentrated in wildlife.--Copyright 1972, Biological Abstracts, Inc.
W73-12812

LASER INDUCED FLUORESCENCE IN ALGAE: A NEW TECHNIQUE FOR REMOTE DETECTION,
Sparcom, Inc., Alexandria, Va.
E. J. Friedman, and G. D. Hickman.
Available from the National Technical Information Service as N73-12527. Report No. NASA-CR-62090, October 1972. 108 p, 37 fig, 3 tab, 4 append. Contract No. NASS-2081.

Descriptors: *Remote sensing, *Absorption, *Fluorescence, *Pigments, *Pollutant identification, *Chlorophyll, Chlorophyta, Electronic equipment, Mechanical equipment, Mathematical studies, Rhodophyta, Cyanophyta, Chlamydomonas, Chlorella.
Identifiers: Chlorophyll a, Laser-excited fluorescence, Porphyridium, Lasers, Agmenellum, Carotenoids, Phycobilin, Phycoerythrin, Phycocyanin, Fluorescence spectra.

Measurement of the absorption and fluorescence spectra were obtained for four types of marine and fresh water algae using a pulsed N2/Ne dye laser as the source of excitation. The algae investigated were Agmenellum, Chlorella, Chlamydomonas, and Porphyridium. The absorption maxima for the algae ranged from 420 to 675 nm while their fluorescent spectra ranged from 580 to 685 nm. It appears feasible that various algal species can be identified by detection of their fluorescent signatures using a tunable laser as the excitation source. However, if one is concerned only with detection of chlorophyll a, the optimum excitation is approximately 600 plus or minus 50 nm while detection is at 685 nm. An analysis of both calculations and laboratory results indicates that it should be feasible to measure chlorophyll a in concentrations as low as 1.9 mg/cu m using a 100 kw peak pulsed laser from an altitude of 500 meters. (Little-Battelle)
W73-12841

A COMPARISON OF LIQUID SCINTILLATION AND GEIGER-MULLER ESTIMATES OF PRIMARY PRODUCTIVITY IN AN IN SITU EXPERIMENT,
Manitoba Univ., Winnipeg. Dept. of Zoology.
F. J. Ward, and M. Nakanishi.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 708-711, May 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Primary productivity, *Radioactivity techniques, *On-site test, *Methodology, Incubation, Algae, Photosynthesis, Water analysis, Light intensity, Carbon dioxide, On-site date collections, On-site investigations.
Identifiers: *Liquid scintillation, *Geiger-Muller estimates, *Comparative studies, Method evaluation, C-14, Sample preparation, Scintillation counting, Shiozu Bay, Lake Biwa, Japan, Error sources.

For an in situ experiment conducted in Shiozu Bay, Lake Biwa, Japan, primary productivity estimates from liquid scintillation radioactivity counts of wet algae were generally higher than those from Geiger-Muller radioactivity counts of desiccated algae. Values at 0 m were similar, the G-M estimate at 0.5 m was 10 percent higher, but from 3 to 13 m the liquid scintillation values ranged from 11 to 33 percent higher than G-M estimates. The 20-m estimates were low and similar. Differences were caused primarily by C-14 losses during desiccation prior to G-M counting. Increasing loss rates between 0.5 and 3.0 m may have been caused by decreasing light intensity. On the basis of surface area, the estimate from liquid scintillation data was 27 percent greater than that obtained from G-M data. The results indicated that previously recommended methods for sample preparation and radioactivity determinations may cause primary productivity estimates from in situ data to be significantly in error. (Mortland-Battelle)
W73-12848

STEAM DISTILLATION: A SIMPLE TECHNIQUE FOR RECOVERY OF PETROLEUM HYDROCARBONS FROM TAINTED FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
R. G. Ackman, and D. Noble.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 711-724, May 1973. 1 fig, 1 tab, 17 ref.

Descriptors: Fish, *Separation techniques, *Methodology, Pollutant identification, Water pollution sources, Oil pollution, *Canada.
Identifiers: *Steam distiallation, Recovery, *Petroleum hydrocarbons, Sample preparation, Muscle, Diesel oil, Gas liquid chromatography, Flame ionization, Gas chromatography, Animal tissues, *Athabaska River (N.S.), *Whitefish.

Fish caught in the Athabaska River were filleted when required, blended with distilled water and transferred to a distillation flask along with flask washings. Antibumping granules were added and the fish muscle blend was simmered for 30 min before distillation to reduce foaming. Neohexane was added to the condensate in a centrifuge tube and shaken vigorously. The neohexane layer which was allowed to separate upon standing for 1 hr or less was analyzed by flame ionization chromatography using a support-coated open-tubular (SCOT) stainless steel column. Samples of diesel oil and fish obtained from a source apparently free from contamination were examined as controls. Simple steam distillation was found to be efficacious for isolation of hydrocarbons from contaminated whitefish. Gas-liquid chromatography on support-coated open-tubular Apiezon-L columns demonstrated that hydrocarbons recovered from the tainted fish had a composition pattern qualitatively similar in detail to that from a sample of diesel oil suspected as the source of contamination. (Holoman-Battelle)
W73-12849

ADDITIONAL STUDIES FOR THE SPECTROPHOTOMETRIC MEASUREMENT OF IODINE IN WATER.
Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.

Available from the National Technical Information Service as N73-10172. Report Nos NASA-CR-128585, FR-1116-101, August 31, 1972. 37 p, 18 fig. NAS 9-12769.

Descriptors: *Spectrophotometry, *Iodine, *Pollutant identification, *Water analysis, Measurement, *Instrumentation, Automatic control, Turbidity, Chemical analysis, Aqueous solutions, Electronics, Automation, Halogens.
Identifiers: *Iodine-iodide spectroscopy, Automated iodine monitoring system, Chemical interference, Isosbestic point.

Previous work in iodine spectroscopy is briefly reviewed. Continued studies of the direct spectrophotometric determination of aqueous iodine complexed with potassium iodine show that free iodine is optimally determined at the isosbestic for these solutions. The effects on iodine determinations of turbidity and chemical substances (in trace amounts) are discussed and illustrated. At the levels tested, iodine measurements are not significantly altered by such substances. The main objective of the present work--a preliminary design for an on-line, automated iodine monitor with eventual capability of operating also as a controller--is

analyzed and developed in detail with respect to optics, mechanics, and circuitry. The resulting design features a single beam colorimeter operating at two wavelengths (using a rotating filter wheel). A flow-through sample cell allows the instrument to operate continuously, except for momentary stop flow when measurements are made. The timed automatic cycling of the system may be interrupted whenever desired, for manual operation. An analog output signal permits controlling an iodine generator. (Holoman-Battelle)
W73-12851

CHARACTERIZATION OF SWEET POTATO PROCESSING WASTES,
North Carolina State Univ., Raleigh.
B. W. Raines.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 73-1201. Ph D Dissertation, 1972. 78 p.

Descriptors: *Industrial wastes, *Food processing industry, *Sweet potatoes, Biochemical oxygen demand, Chemical oxygen demand, Carbohydrates, Cellulose, Lignins, Biodegradation, Carbon, Waste treatment, *Waste identification, *Pollutant identification.
Identifiers: Characterization, Sugars, Starches, Pectin gums, Mucillages, Hemicelluloses.

Characterization of liquid waste from sweet potato processing plants was conducted in three stages. These were: (1) A study of waste strength as defined by 5-day biochemical oxygen demand, chemical oxygen demand (COD) and total carbon (TC). (2) A study of the potential biodegradability of the waste via chemical determination of individual carbohydrate components. (3) A study of the effect of acclimated versus nonacclimated seed organisms on the biochemical oxgyen demand test. The 'readily biodegradable' carbohydrate of sweet potato waste constituted 88 percent of the total carbohydrate, dry weight basis and included sugars (17 percent), starch (56 percent) and pectin gums and mucillages (15 percent). Less 'readily biodegradable' carbohydrates were hemicelluloses (5 percent), cellulose (1 percent) and lignin (0.5 percent). The data demonstrated that substrate availability was not a limiting factor in the 5-day BOD method for sweet potato waste. duplicate analyses of acclimated seed versus unacclimated seed organisms on BOD revealed little difference in results when utilizing culture material obtained from aerated raw sewage and one grown under conditions experienced in the BOD test. 'Most probable numbers' reached 5 million/ml in one to two days then rapidly decreased to 300/ml at five days. Preliminary investigations indicated that nitrogen and/or phosphorus concentrations in the BOD analysis were limiting to bacterial growth and may explain the low BOD results. (Little-Battelle)
W73-12852

AROMATIC HYDROXYLATION AS AN ANALYTICAL REACTION,
Wisconsin Univ., Madison.
K. S. Albert.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 72-31,511. Ph D Dissertation, 1972. 169 p.

Descriptors: *Aqueous solutions, *Aromatic compounds, *Chemical reactions, *Chemical analysis.
Identifiers: *Hydroxylation, *Sample preparation, Cyclodextrin, Glucose, Calibration curves, Benzene, Chemical interference.

The Hamilton hydroxylating system, an aqueous solution of ferric ion, catechol, and hydrogen peroxide, hydroxylates aromatic compounds in aqueous solution. The further development and application of this system to the quantitative determination of some aromatic compounds are reported. By reducing the initial ratio of peroxide to aromatic to 2.0 or less, stable absorbance values were obtained, the yield depending upon the ratio. The instability of the initial hydroxylation product has been overcome by incorporating a 'stabilizer' in the reaction mixture. Two such modified Hamilton systems which were studied extensively are those of cyclodextrin at 25 degrees and glucose at 25 degrees and 75 degrees. Using the cyclodextrin-modified Hamilton system, many mono- and disubstituted benzene derivatives give linear absorbance-concentration responses in the range 0.0001-0.0008 M with apparent molar absorptivities between 1000 and 5000. The glucose-modified Hamilton hydroxylating system has been suggested for the analysis of aromatic compounds at 75 degrees. Calibration curves were linear in the range 0.0001-0.0001 M of aromatic compound, and molar absorptivities of 1000-5000 were observed. The results establish that (a) hydroxylation is a useful analytical process; (b) a model enzyme system can be exploited for its analytical utility; and (c) the concept of developing analytical selectivity by means of complex formation with cyclodextrins may be worth further exploitation. As one of the few methods available for the phenyl group as a functional group for analytical purposes, this technique has the advantages and limitations of a general functional group method. (Little-Battelle)
W73-12853

PARTICULATE MANGANESE IN SEA WATER STRESSING REGIMES IN MARINE ANOXIC BASINS,
Washington Univ., Seattle.
E. J. Fluorie.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 73-3708. Ph D Dissertation, 1972. 150 p.

Descriptors: *Sea water, *Manganese, *Dissolved oxygen, *Distribution patterns, *Hydrogen sulfide, Spectroscopy, Suspended solids, *Columbia River, Mathematical models.
Identifiers: *Emission spectroscopy, Saanich Inlet.

A method for the analysis of particulate Mn using emission spectroscopy was developed to determine the concentration of Mn in suspended matter. The distribution of particulate Mn in five anoxic basins was observed. The differences and similarities of these basins are shown by data obtained on their chemical and physical characteristics. In addition, the distributions of both particulate Mn and the physical and chemical variables were monitored in Saanich Inlet, a basin whose oxygen-hydrogen sulfide regime changes monthly. The particulate Mn distribution in the observed basins showed a consistent pattern which can be correlated to the oxygen and hydrogen sulfide regime. The results indicate Mn exists mainly in particulate form in the oxygenated water and in a soluble form in water containing hydrogen sulfide. A model based on chemical thermodynamics and inferred kinetics is proposed to explain the distribution of particulate Mn in marine anoxic basin. The concentrations of particulate Mn in the open ocean were found to be low unless influenced by land runoff and the values of the Columbia River reflected the particulate matter distribution described by previous investigations. (Little-Battelle)
W73-12854

A SIMPLE METHOD FOR RECORDING FISH HEART AND OPERCULUM BEATS WITHOUT THE USE OF IMPLANTED ELECTRODES,
Maine Univ., Orono. Dept. of Zoology.
For primary bibliographic entry see Field 07B.
W73-12858

IDENTIFICATION OF THE LIMITING NUTRIENT AND SPECIFIC GROWTH RATE,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 05C.
W73-12861

DETERMINATION OF LEAD IN PETROLEUM ADDITIVES USING ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Vanderbilt (R. T.) Co., Inc., East Norwalk, Conn.
G. R. Supp, I. Gibbs, and M. Juszli.
Atomic Absorption Newsletter, Vol 12, No 3, p 66-67, May-June 1973. 1 fig, 3 tab, 5 ref.

Descriptors: *Oil, *Lead, Heavy metals.
Identifiers: *Atomic absorption spectrophotometry, *Sample preparation, Lubricating oil, Grease, Crankcase oil, Lubricants, Lead diamyldithiocarbamate, Lead naphthenate, Lead dinonylnaphthalene sulfonate, Accuracy.

Petroleum samples were analyzed for lead compounds by dissolving samples and stardards directly in methyl isobutyl ketone and analyzing by atomic absorption. This procedure eliminated separations and acid breakdown followed by titration or precipitation reactions. Results of analysis by AA and wet chemistry agreed within experimental error when samples containing lead cyclohexanebutyrate, lead diamyldithiocarbamate, lead naphthenate, or lead dinonylnaphthalene sulfonate were analyzed. (Little-Battelle)
W73-12864

AN IMPROVED AA MICROSAMPLING SYSTEM,
Perkin-Elmer Corp., Norwalk, Conn.
F. J. Fernandez.
Atomic Absorption Newsletter, Vol 12, No 3, p 68-70, May-June 1973. 2 fig, 1 tab, 4 ref.

Descriptors: *Laboratory equipment, *Lead, Heavy metals, Mechanical equipment.
Identifiers: *Atomic absorption spectrophotometers, *Reproducibility, *Microsampling system, Blood, Atomic absorption spectrophotometry, Precision.

The Perkin-Elmer AA Microsampling System has been redesigned to improve performance, mechanical stability, and ease of operation. The changes include a new mounting system which attaches directly to the burner mount base, a slide mechanism having a smoother and shorter action, a heat shield usable with both the Delves Cup and Sampling Boat systems, plus a new mounting system for the Sampling Boat which permits rapid boat installation and interchange. Blood samples analyzed for lead show that the reproducibility of results is very good using the new system. (Little-Battelle)
W73-12865

AN IMPROVED METHOD FOR DETERMINING ORGANICS BY ACTIVATED CARBON ADSORPTION AND SOLVENT EXTRACTION - PT. II (TEST METHOD),
National Environmental Research Center, Cincinnati, Ohio.
R. W. Buelow, J. K. Carswell, and J. M. Symons.
Journal of the American Water Works Association, Vol 65, No 3, p 195-199, March 1973. 2 fig, 2 tab, 8 ref.

Descriptors: *Solvent extractions, *Adsorption, *Pollutant identification, *Activated carbon, Water pollution, Organic wastes, Organic compounds, Laboratory tests, Water analysis, Water sampling, Storage, Waste water (Pollution), Organic matter, Waste identification, Distillation, Gravimetric analysis.
Identifiers: *Dissolved organic matter, CAM sampler, Carbon chloroform extract, Carbon alcohol extract, Organic solvents.

The complete test procedure is presented for determining organics in water in the dissolved

form by activated carbon adsorption and solvent extraction. Organic materials adsorbed on a sample of activated carbon are removed by sequential extraction with two organic solvents. The extracts are processed by volume reduction through distillation and drying. The quantities of organic materials are then determined gravimetrically. This method is primarily for monitoring the general organic content of water and is not designed as a collector of organics for further identification, although, with certain precautions, the resulting extracts can be reprocessed. This method does not require expensive instrumentation and divides the organics into 2 general classes - chloroform soluble and alchol soluble. A special sampler (miniature CAM sampler) must be used in order to obtain a representative sample for this method. (See also W73-07574) (Holoman-Battelle)
W73-12866

VIRUSES IN METROPOLITAN WATERS: CONCENTRATION BY POLYELECTROLYTES, FREEZE CONCENTRATION, AND ULTRAFILTRATION,
Chicago Board of Health, Ill.
For primary bibliographic entry see Field 05F.
W73-12867

THE MONITORING OF ORGANIC MATTER WITH POLYURETHANE FOAM,
Manitoba Univ., Winnipeg. Dept. of Chemistry.
H. D. Gesser, A. B. Sparling, A. Chow, and C. W. Turner.
Journal of the American Water Works Association, Vol 65, No 3, p 220-221, March 1973. 1 fig, 8 ref.

Descriptors: *Organic matter, *Monitoring, *Water analysis, Water pollution, *Pollutant identification, Organic compounds, Methodology, Organic wastes, Waste water (Pollution), Water treatment, Solvent extractions, Efficiencies, Chemical analysis.
Identifiers: Polyurethane foam, Trace levels, Electron capture gas chromatography, Sample preparation.

Standard carbon adsorption apparatuses with the carbon replaced by previously cleaned and extracted polyurethane foam plugs were installed at the municipal water treatment plant at Morris, Manitoba, to determine the feasibility of the test method and the efficiency of the water treatment process. Water from the Red River which enters the plant is treated by the carbon-alum-chlorine method. The foam plugs were extracted with Lexane, concentrated in a flash evaporator, made up to a standard volume, and analyzed by electron capture gas chromatography. The results obtained showed that the treatment process did not reduce the organic contaminant level to any significant extent. The use of polyurethane foam plugs is a promising alternate to the carbon adsorption method for the determination of trace organic contaminants in water. (Holoman-Battelle)
W73-12868

CHARACTERIZATION OF CHEMICAL SLUDGES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
R. J. Calkins, and J. T. Novak.
Journal of the American Water Works Association, Vol 65, No 6, p 423-428, June 1973. 8 fig, 5 tab, 6 ref.

Descriptors: *Sewage sludge, *Waste identification, Sludge treatment, Pollutant identification, *Missouri River, Solid wastes, Filtration, Coagulation, Water pollution sources, Treatment facilities, Missouri.
Identifiers: Characterization, *Chemical sludges, Settleable solids, Specific resistance, Cake solids, Filtration rates, Settleability, Cationic flocculants, Softening sludges.

The characteristics of sludges generated from the Missouri River were determined. The sludges collected from several treatment plants were characterized by their settled-solids concentration, filtering rate which includes the parameter 'specific resistance', and cake solids. The solids concentrations in the settled sludges were found to vary to some extent with the type of coagulant used, the turbidity of the water, and, in the case of mixed sludges (softening-coagulant), the variations in the lime dose. In evaluating sludge characteristics generated from a combined softening and coagulation process, it was found that the concentration of magnesium may greatly influence the results obtained. Comparisons of sluge solids from processes where no lime was added indicate that sludges generated from turbid waters can be expected to attain much higher settled-solids concentration than sludges from relatively clean waters. A relationship between cake solids and settled solids was found to exist for all sludges in this study. No simple relationship was found to exist for specific resistances of the various sludges. Several trends can be seen from the data, however. In general, combined softening-coagulant sludges filter much more readily than do pure coagulants. The presence or absence of magnesium seemed to have no influence on filtering characteristics of mixed sludges. Changes in the sludge characterization parameters occurred with time, primarily for the iron and alum residues. None of the changes was dramatic, but all indicate that sludge initally discharged from a treatment plant is somewhat different from sludge that is stored or lagooned. (Holoman-Battelle)
W73-12871

VOLTAMMETRIC STUDY OF THE HYDROGEN ION/HYDROGEN COUPLE IN ACETONITRILE/WATER MIXTURES,
Tennessee Univ., Knoxville. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12872

SODIUM TUNGSTEN BRONZE AS A POTENTIOMETRIC INDICATING ELECTRODE FOR DISSOLVED OXYGEN IN AQUEOUS SOLUTION,
Ames Lab., Iowa.
P. B. Hahn, M. A. Wechter, D. C. Johnson, and A. F. Voigt.
Analytical Chemistry, Vol 45, No 7, p 1016-2021, June 1973. 10 fig, 4 tab, 10 ref.

Descriptors: *Dissolved oxygen, *Aqueous solutions, *Pollutant identification, *Indicators, *Chemical analysis, Chemical reactions, Inorganic compounds, Hydrogen ion concentration, Temperature, Iron, Copper, Mercury, Cations.
Identifiers: Sodium tungsten bronze electrodes, *Potentiometry, Precision, Accuracy, Ionic interference, EDTA, Chemical interference, Reproducibility.

Sodium tungsten bronzes, nonstoichiometric compounds, NaxWO3, with 0.5 less than x less than 0.9 were found to respond potentiometrically to dissolved oxygen in basic solutions. A Nernstian response, with a slope of approximately 120 mV per decade, was exhibited in the concentration range 0.2-8 ppm. Oxygen analyses were made in this range with precision and accuracy approaching plus or minus 5 percent. The large slope and other observations place serious doubt on customary oxygen redox reactions as possible mechanisms. An absorption mechanism is proposed which involves the displacement of adsorbed hydroxide ions by molecular oxygen. (Holoman-Battelle)
W73-12873

INSTRUMENTAL AND NUMERICAL CONSIDERATIONS FOR ON-LINE INTERPRETATION OF HIGH RESOLUTION MASS SPECTRAL DATA,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12874

POLYAROMATIC HYDROCARBONS IN HIGH--BOILING PETROLEUM DISTILLATES. ISOLATION BY GEL PERMEATION CHROMATOGRAPHY AND IDENTIFICATION BY FLUORESCENCE SPECTROMETRY,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
J. F. McKay, and D. R. Latham.
Analytical Chemistry, Vol 45, No 7, p 1050-1055, June 1973. 11 fig, 2 tab, 17 ref.

Descriptors: *Separation techniques, Oil, Ion exchange, Pollutant identification.
Identifiers: *Polyaromatic hydrocarbons, *Gel permeation chromatography, *Ion exchange chromatography, *Thin layer chromatography, *Fluorescence spectroscopy, 1.12 2.3-dibenzoperylene, 1 12-o-phenyleneperylene, pyreno- (1.3:10'.2')pyrene, 2.3 10.11-dibenzoperylene, 1 2 4 5-dibenzopyrene, benzo (e)pyrene, benzo (g)chrysene, Crude oil, Petroleum distillates.

The identification of seven polyaromatic ring systems in petroleum is reported. The ring systems are 1.12,2.3-dibenzoperylene; 1,12-o-phenyleneperylene, pyreno- (1.3:10'.2')pyrene; 2.3,10.11-dibenzoperylene; 1,2,4,5-dibenzopyrene, benzo (e)pyrene, and benzo (g)chrysene. These polyaromatic hydrocarbons were isolated by a separation scheme involving ion exchange chromatography, gel permeation chromatography, and thin-layer chromatography and were identified by fluorescence spectroscopy. Gel permeation chromatography separated pericondensed aromatic ring systems from catacondensed ring systems and the other components of an acid concentrate. (Little-Battelle)
W73-12875

OPTIMUM PROCEDURE FOR THE DETERMINATION OF SELENIUM IN BIOLOGICAL SPECIMENS USING SE-77M NEUTRON ACTIVATION,
Veterans Administration Hospital, Omaha, Nebr.
A. J. Blotcky, L. J. Arsenault, and E. P. Rack.
Analytical Chemistry, Vol 45, No 7, p 1056-1060, June 1973. 5 fig, 2 tab, 14 ref.

Descriptors: *Neutron activation analysis, *Data processing, Radioactivity techniques, Irradiation, Pollutant identification.
Identifiers: *Tissue, *Blood, *Selenium, Biological samples, Sample preparation, Se-77m, Detectors, Detection limits.

An optimum procedure is outlined for the rapid quantitative determination of trace (greater than or equal to 0.06 microgram) selenium in serum and tissue using Se-77m neutron activation. Sample preparation, irradiation procedures, types of detector assemblies, and spectral analyses and data reduction are discussed. The optimum procedure tuilizing a low-power nuclear reactor consisted of irradiating lyophilized tissue samples or dialyzed-lyophilized serum samples for 20 sec, with a 20-sec decay time prior to radioassay. The most suitable radioassay assembly was the 5-mm X 3-in NaI (Tl) detector system. Spectral analyses and data reduction consisted of eliminating the interferences of isotopes of relatively long half-lives by spectrum subtraction and correction. Comparisons between the results obtained by the discussed Se-77m procedure and values quoted for an NBS Bovine Liver Standard were excellent. (Little-Battelle)
W73-12876

APPLICATION OF LIQUID CHROMATOGRAPHY TO POLLUTION ABATEMENT STUDIES OF MUNITION WASTES,
Army Natick Labs., Mass. Pioneering Research Lab.
J. T. Walsh, R. C. Chalk, and C. Merritt, Jr.

Analytical Chemistry, Vol 45, No 7, p 1215-1220, June 1973. 9 fig, 1 tab, 8 ref.

Descriptors: *Waste water (Pollution), *Water analysis, *Adsorption, *Resins, Industrial wastes, Pollution abatement, Separation techniques, Color, Activated carbon, Fish, Toxicity.
Identifiers: *TNT, *Liquid chromatography, Munitions plants, Amberlite XAD-2, Chromatograms, Styrene-divinylbenzene copolymer.

Since waste waters from TNT manufacture contain nitrobodies which are toxic (2.5 ppm toxic to fish), explosive, and colored, they consititute a serious pollution hazard. The application of liquid chromatography to pollution abatement studies of TNT waste waters is described. These studies include the characterization by liquid chromatography of the color formation occurring in TNT water, the development of a simple, direct analysis for alpha-TNT and a description of how liquid chromatography was used to evaluate pollution abatement processes for the removal of nitrobodies from munition waste waters. The abatement processes investigated were the column adsorption type, which required absorption isotherm, breakthrough capacity, saturation capacity, and column regeneration efficiency data. The acquisition of these data by liquid chromatographic means is described. The results showed that an adsorbent resin of the styrene-divinylbenzene copolymer type possessed nitrobody adsorption efficiencies at least equal to those of activiated carbon and had the important added advantages of easy chemical regeneration and significantly long life cycle. (Little-Battelle)
W73-12877

THE ASSOCIATION OF AMPHIPODS IN THE SHALLOW-WATER SAND HABITAT OF STRANGFORD LOUGH, CO. DOWN,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
A. A. Fincham.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 119-125, February 1973. 3 fig, 2 tab, 12 ref.

Descriptors: *Amphipoda, *Shallow water, *Systematics, *Speciation, Crustaceans, Benthic fauna, Dominant organisms, Sands, Marine animals, Invertebrates, Coarse sediments, Fluvial sediments, Saline soils, Soil analysis, Animal groupings, Classification, Varieties.
Identifiers: *Marine habitats, Strangford Lough, Beach fleas, Macroinvertebrates, Arthropods, Marinogammarus, Hippomedon denticulatus, Ampelisca brevicornis, Bathyporeia guilliamsoniana, Urothoe marina, Harpinia antennaria, Stenothoe monoculoides, Perioculodes longimanus, Pontocrates arenarius, Gammarus locusta, Dexamine spinosa, Aora typica, Microdeutopus chelifer, Lembos longipes, Microprotopus maculatus, Eurystheus maculatus, Jassa falcata, Ericthonius brasiliensis, Corophium crassicorne, Phtisica marina, Bathyporeia nana, Urothoe elegans.

Ten stations were sampled in the shallow-water sand habitat of Strangford Lough using a naturalist's dredge. Sediment samples were analyzed to determine median diameter (ranging from 1.13 to 3.23 phi), Phi quartile deviation (ranging from 0.17 to 0.65 phi) and Phi quartile skewness (ranging from -0.11 to -0.04 phi). Twenty-two species of amphipod belonging to thirteen families were identified; ten species were new records for Strangford Lough and the Family Phoxocephalidae was recorded for the first time. The average number of species per station was nine and average abundance was 660 amphipods per station. The most frequently occurring species was the caprellid Phtisica marina (present in 90 percent of the samples); the overall dominant species was the corophiid Corophium crassicorne representing 52 percent of all specimens recorded. A matrix of indices of similarity between stations based on species composition and of sediment type based on median diameter showed a close correlation; infaunal species showed a marked preference for sediment type. There were two main groupings: (1) at the entrance to the Lough, characterized by coarser sediments and rapid tidal streams and (2) stations further in the Lough with finer sediments and more gentle water movement. The evolution of this amphipod fauna is discussed and compared with the adjacent western Irish Sea shallow-water sand amphipod fauna. Post-glacial isolation and fine sediment deposition have acted as selection pressures in maintaining the association of amphipods found. (Holoman-Battelle)
W73-12879

BIOMASS CHARACTERISTICS OF THE ASIDIAN MOLGULA MANHATTENSIS (DEKAY),
Maryland Univ., Solomons. Natural Resources Inst.
D. H. Hamilton, Jr., and J. Yurchyk.
Chesapeake Science, Vol 14, No 1, p 67-68, March 1973. 2 tab, 6 ref.

Descriptors: *Biomass, *Biological properties, Invertebrates, Regression analysis, Volume, Marine animals, Secondary productivity, Chemical analysis.
Identifiers: *Macroinvertebrates, *Molgula manhattensis, *Tunicates, Characterization, Linear regression analysis, Dry weight, Wet weight, Ash-free dry weight.

Data are reported on wet weight, dry weight, ash-free dry weight, and volume for a random sample of 101 Molgula for the purpose of simplifying future calculations of its productivity. The relationships were examined between the various weight measures and between volume and weight by linear regression analysis. The average measurements were as follows (range in parentheses): Volume, 5.26 cc (0.67-11.56 cc); dry weight, 0.125 g (0.02-0.26 g); wet weight, 3.98 g (0.43-9.09 g); ash-free dry weight, 0.05 g (0.01-0.09 g). The correlation of volume with either weight measure is not strong and this is probably a consequence of assuming a spherical shape. Each of the weight measures is strongly correlated with the others (r greater than 0.90); in the future measurement of wet weight alone will permit rapid determination of biomass in the preferred units of ash-free dry weight. (Holoman-Battelle)
W73-12880

TOTAL MERCURY ANALYSIS: REVIEW AND CRITIQUE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
R. S. Reimers, W. D. Burrows, and P. A. Krenkel.
Journal Water Pollution Control Federation, Vol 45, No 5, p 814-828, May 1973. 2 tab, 156 ref.

Descriptors: *Analytical techniques, *Reviews, *Mercury, *Documentation, *Methodology, *Evaluation, Heavy metals, Aqueous solutions, Inorganic compounds, Neutron activation analysis, Polarographic analysis, Volumetric analysis, Colorimetry, Oxidation, Gravimetric analysis, Sediments, Soil analysis, Water analysis, Ion exchange, Chemical precipitation, Reduction (Chemical), Mass spectometry, Cations, Neutralization, Chemical reactions, Photometry, X-ray fluorescence.
Identifiers: Organomercury compounds, Biological samples, Environmental samples, Sample preparation, Chemical interference, Natural waters, Atomic absorption spectrophotometry, Ion selective electrodes, Dithizone method, Wet oxidation method, Amperometry, Flameless atomic absorption spectrophotometry, Preconcentration, Animal tissues, Blood, Errors, Electrodeposition, Mercuric sulfide, Mercurous chloride, Mercurous iodate, Mercurous oxalate, Mercurous cupferron, Mercurous chromate, Mercurous vanadate, Mercurous molybdate, Mercurous tungstate, Catalysis, Catalytic methods, Complexiметric titration, Oxidimetric titration, Iodide selective electrode, Detection limits, Sensitivity, Dimethyl mercury, Spark source mass spectrometry, Emission spectroscopy, Pyrolysis.

With the recent concern about mercury as an environmental hazard came numerous reviews and a large amount of research concerning new methods of mercury analysis. The history and an extensive literature review of mercury analysis are presented, as well as a critique of the different methods. Conclusions are presented as to the best method in terms of convenience, cost, simplicity, and sensitivity. At present, wet oxidation with potassium permanganate and potassium persulfate followed by chemical reduction and analysis of the elemental mercury by flameless atomic absorption spectroscopy is the most convenient method for determining total mercury. Economically, the best method remains the classical colorimetric dithizone technique. Atomic absorption instrumentation, because of its economy, simplicity, and sensitivity, is the most useful method for mercury analysis. (Holoman-Battelle)
W73-12885

SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA,
Cham/Hill, Corvallis, Oreg.
C. Zadorojny, S. Saxton, and R. Finger.
Journal Water Pollution Control Federation, Vol 45, No 5, p 905-912, May 1973. 6 fig, 2 tab, 15 ref.

Descriptors: *Ammonia, *Water analysis, Sea water, Estuaries, Colorimetry, *Spectrophotometry, Salinity, *Waste water (Pollution), Ureas, Amino acids, Electrolytes, Absorption, Nitrites, Nitrates, Sulfides, Iodides, Carbonates, Bicarbonates, Fluorides, Copper, Manganese, Cadmium, Zinc, Mercury, Lead, Cobalt, Nickel, Aluminum, Iron, Ions, Freshwater.
Identifiers: Chemical interference, Detection limits, *Indophenol blue method, Sample preparation, Reproducibility, Chemical recovery, Cyanides, Thiocyanates, Thiosulfates, Barium, Tin, L-alanine, L-arginine, L-aspartic acid, L-histidine-HC, Glycine, L-hydroxyproline, L-isoleucine, L-lysine-HCI, L-methionine, L-phenylalanine, L-proline, L-serine, L-threonine, L-tryptophan, L-tyrosine, L-valine, Sulfites.

An improved indophenol blue method was investigated for the determination of ammonia in fresh, estuarine and marine waters, and wastewaters. Absorbance curves were prepared by adding known amounts of ammonium-nitrogen to ammonia-free water and to Pudget Sound seawater. Wastewaters were diluted, spiked, and analyzed to determine reproducibility of the method. Analyses were conducted to study the effects of 20 inorganic electrolytes, urea, or amino acids. No major interferences occured with these substances or as a result of variations in salinity. The range of ammonia determination was as follows: with intensifier, 0.001 to 1.0 mg/l ammonia nitrogen; without intensifier, 1 to 51 mg/l ammonia nitrogen. It is concluded that the method is simple and well suited for routine use. (Little-Battelle)
W73-12886

ATP POOLS IN PURE AND MIXED CULTURES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
I. C. Kao, S. Y. Chiu, L. T. Fan, and L. E. Erickson.
Journal Water Pollution Control Federation, Vol 45, No 5, p 926-931, May 2973. 6 fig, 1 tab, 7 ref.

Descriptors: *E. coli, *Methodology, *Monitoring, Activated sludge, Sludge treatment, Efficiencies, Bioindicators, Cultures, Centrifugation, Cytological studies, Aerobic bacteria, Sewage bacteria.
Identifiers: *Adenosine triphosphate, *Pseudomonas aeruginosa, Firefly luminescence, Cul-

ture media, Luciferin-luciferase method, Mixed cultures, Pure cultures, Species interaction, Bacterial physiology, Glucose, Sample preparation.

E. coli and Pseudomonas aeruginosa were grown in a mixed culture for about 9 hr at 30C with glucose as an energy source. The same organisms were also grown separately in the same medium. After recovery, washing and drying, the glucose concentration was determined by the glucostat method and ATP concentration by use of a biometer. The sample was prepared for ATP measurement by mixing one ml of culture broth with one ml butanol for 10 sec to lyse the cells. Eight ml of octanol was added, the sample was vigorously shaken for 10 sec and centrifuged at 3000 rpm for 3 min. Butanol was partitioned into the top octanol layer and ATP into the bottom aqueous layer. The extracted ATP (0.01 ml) was then injected into a biometer tube containing luciferin and luciferase. The resultant light flash was converted into an electrical signal and then a decimal count representing the concentration of ATP in the sample. The fact that the ATP concentration in the cells from the mixed culture was appreciably smaller than that in the pure cultures indicated that the species in the mixed culture interact. The fact that cell yields in mixed cultures were far smaller than those in pure cultures also indicated the existence of such interaction. (Mortland-Battelle)
W73-12887

THE USE OF FISH AS SENSORS IN INDUSTRIAL WASTE LINES TO PREVENT FISH KILLS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-12889

INSECTICIDE RESIDUES IN WATER AND SEDIMENT FROM CISTERNS ON THE U.S. AND BRITISH VIRGIN ISLANDS - 1970,
Central Michigan Univ., Mount Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-12894

AN IMMOBILIZED CHOLINESTERASE PRODUCT FOR USE IN THE RAPID DETECTION OF ENZYME INHIBITORS IN AIR OR WATER,
Midwest Research Inst., Kansas City, Mo.
L. H. Goodson, W. B. Jacobs, and A. W. Davis.
Analytical Biochemistry, Vol 51, No 2, p 362-367, February 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Monitoring, *Water pollution, *Insecticides, Pollutant identification, Air pollution, Organophosphorus pesticides, Carbamate pesticides, Adsorption, Stability, Methodology.
Identifiers: *Enzymatic inhibitors, *Cholinesterase, *Enzyme activity, Enzyme preparation.

Cholinesterase has been immobilized on the surface of open-pore urethane foam in a two-step process in which (1) cholinesterase is adsorbed on aluminum hydroxide gel during the precipitation of the aluminum hydroxide from a solution of aluminum chlorohydroxide, and (2) the aluminum hydroxide gel-enzyme precipitate is suspended in a starch slurry and applied to urethane foam. The resulting product is shown to retain its activity during monitoring of water for the presence of certain organophosphate and carbamate insecticides. Details are given for the preparation of both the plain starch gel-immobilized product and for the improved aluminum hydroxide gel-starch gel enzyme pads. (Holoman-Battelle)
W73-12901

SOME MARINE DIATOMS FROM THE GALAPAGOS ISLANDS,
For primary bibliographic entry see Field 02I.
W73-12902

THE CHARACTERIZATION OF SOLUBLE PHOSPHORUS RELEASED BY LIMNETIC ZOOPLANKTON,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-12904

AN EVALUATION OF LIQUID SCINTILLATION COUNTING TECHNIQUES FOR USE IN AQUATIC PRIMARY PRODUCTION STUDIES,
Queen Elizabeth Coll., London (England). Dept. of Biology.
P. R. Pugh.
Limnology and Oceanography, Vol 18, No 2, p 310-319, March 1973. 2 fig, 1 tab, 25 ref.

Descriptors: *Evaluation, *Primary productivity, Methodology, *Radioactivity techniques, *Aquatic environment, Aquatic productivity, Carbon radioisotopes, Diatoms, Chrysophyta, Marine algae, Yeasts, Marine fungi, Phytoplankton, Surfactants.
Identifiers: *Liquid scintillation, *Scintillation counting, Membrane filters, Accuracy, Reagents, Solubilization, Phaeodactylum tricornutum, Metschnikovia zobelli, Soluene-100, Hyamine 10-X, Triton X-100, NCS, C-14.

Methods evaluated for the liquid scintillation counting of samples from aquatic primary production studies include the counting of intact filters and cells in a toluene fluor, solubilization and counting of membrane filters and cells in various reagents, and counting of a suspension of cells mixed with the fluor. A 1:1 Triton X-100:toluene fluor was very effective for the suspension of cells and gave high counting efficiencies. Up to 5 ml of sample could be mixed with the fluor, but this was considered inadequate for most primary production studies. The filter standardization method for the counting of intact filters was investigated further and found to be applicable over a wide range of conditions but only accurate when the weight of algae on the filters was small (less than 1 mg). Direct solubilization of the filters and cells in a naphthalene-dioxane or 2-methoxyethanol-toluene fluor were the simplest, most accurate, and economical methods for primary production studies; the latter dissolved both wet and dry cellulose nitrate membrane filters and gave excellent replicate counting. (Holoman-Battelle)
W73-12907

MEMBRANE FILTER RETENTION--A SOURCE OF ERROR IN THE C-14 METHOD OF MEASURING PRIMARY PRODUCTION,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
J. W. McMahon.
Limnology and Oceanography, Vol 18, No 2, p 319-324, March 1973. 5 fig, 1 tab, 10 ref.

Descriptors: *Primary productivity, Methodology, *Water analysis, *Radioactivity techniques, *Retention, *Measurement, Phytoplankton, Volume, Carbon radioisotopes, Absorption, Chemical analysis.
Identifiers: *Membrane filters, *Error sources, Liquid scintillation, Scintillation counting, C-14, Asterionella formosa, Maskinonge Lake, Grenadier Pond.

The relationship between volume of water filtered and apparent specific activity of phytoplankton in which the latter decreases (cpm C-14/ml) with increasing volume filtered, previously attributed to cellular damage to phytoplankton during vacuum filtration, is now considered mainly due to retention of unfixed radiotracer on the membrane filter. The retention capacity for C-14 by the filter, expressed as radioactivity per milliliter filtered, is maximum for small sample volumes (less than or equal to 1 ml), decreasing to a constant value when sample volumes are larger than 100 ml. This is attributed partially to adsorption in the filter and probable retention of C-14 bound to unknown substances in the water or on the filter which are eluted or exchanged by passage of volumes of water of 100 ml or greater. This 'washing' effect permits almost all of the C-14 not fixed in organisms to pass through the filter. (Holoman-Battelle)
W73-12908

SUGAR-COATED DAPHNIA: A PRESERVATION TECHNIQUE FOR CLADOCERA,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
D. J. Hall.
Limnology and Oceanography, Vol 18, No 2, p 331-333, March 1973. 1 fig, 4 ref.

Descriptors: *Daphnia, *Methodology, Zooplankton, Invertebrates, *Crustaceans.
Identifiers: *Sample preservation, *Sucrose, Macroinvertebrates, Daphnia pulex, Daphnia galeata.

A simple preservation technique is described which utilizes sucrose to prevent carapace distortion and loss of broodpouch contents due to ballooning in Daphnia. Zooplankton samples collected from Little Mill Lake by vertical tows of a 75-micron-mesh plankton net through 9 m were transferred to a 75-micron Nitex screen glued to the bottom of an acrylic cylinder, immersed in carbonated water, washed into sample bottles containing appropriate concentrations of sucrose and 4 percent formalin. Carapace distortion and loss of eggs by preserved specimens were prevented by adding 40 g/liter sucrose to 4 percent formalin. Differences in size and species composition may influence the threshold sugar concentration at which ballooning is prevented. (Holoman-Battelle)
W73-12910

QUANTITATIVE SAMPLING OF LIVE ZOOPLANKTON WITH A FILTER-PUMP SYSTEM,
Pacific Gas and Electric Emeryvill, Calif. Engineering Research Dept.
J. W. Icanberry, and R. W. Richardson.
Limnology and Oceanography, Vol 18, No 2, p 333-335, March 1973. 1 fig, 7 ref.

Descriptors: *Zooplankton, *Equipment, *Efficiencies, Plankton nets, Methodology, Construction, Water sampling, Filtration, Mortality, Thermal pollution, Cooling water.
Identifiers: *Filter-pump system *Quantitative sampling, Performance evaluation, Survival.

A conventional plankton net was inadequate for study of the survival of zooplankton passing through the cooling water systems of thermal power plants. A filter collection system was designed which allows survivals of 90-95 percent by reducing water velocities and turbulence within the collection chamber. The filter-pump system consisted of a specially designed filter connected to a Labawco type P general purpose centrifugal pump driven by an electric motor. Comparisons of fishing abilities did not show any significant differences between a filter pump and a plankton net. (Holoman-Battelle)
W73-12911

BACTERIAL CONTENT OF PARTICULATE MATTER IN OFFSHORE SURFACE WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-12912

BEHAVIOR OF THE GOLDFISH AS AN EARLY WARNING SYSTEM FOR THE PRESENCE OF POLLUTANTS IN WATER,
Polytechnic Inst. of Brooklyn, N.Y. Dept. of Social Sciences.
K. Salzinger, S. P. Fairhurst, S. J. Freimark, and F. D. Wolkoff.
Journal of Environmental Systems, Vol 3, No 1, p 27-40, Spring 1973. 2 fig, 31 ref.

Descriptors: *Pollutant identification, *Bioindicators, *Fish behavior, *Water pollution, Mercury, Lethal limit, Water pollution effects, Toxicity, Reviews, Hydrogen ion concentration, Salinity, Water temperature, Pesticides, Heavy metals, Alkali metals, Aluminum, Cadmium, Cobalt, Calcium, Copper, Iron, Lead, Manganese, Potassium, Strontium, Zinc, Magnesium.
Identifiers: *Goldfish, *Carassius auratus, *Biomonitoring, Barium, Lithium, Silver, Tin.

The literature on the effects of pollutants on fish, particularly goldfish, in terms of lethal dosage and behavioral changes are reviewed. Results are presented of an experiment showing the effects of two very low concentrations of mercury on the behavior of goldfish. Twelve goldfish were conditioned to form different behavior patterns to obtain food (three fish to each pattern). After stabilization of these patterns, one fish from each pattern was placed in mercury polluted water at a concentration of 0.01 ppm, one in water polluted at 0.006 ppm, and the third in unpolluted water. All four fish placed in the more highly polluted water showed the largest drop in response rate. All but one of the fish placed in the lower-concentration polluted water showed greater decrease in response than those in the unpolluted water. The results suggest that the goldfish might be a potential pollution monitor. (Mortland-Battelle)
W73-12916

POLIOVIRUS IN A WATER SUPPLY,
Michigan Dpt. of Public Health, Lansing. Bureau of Environmental Health.
For primary bibliographic entry see Field 05B.
W73-12922

DDT IN SOME NEW ZEALAND MARINE AND FRESHWATER FAUNA,
Department of Agriculture, Wellington (New Zealand). Wallaceville Animal Research Center.
S. R. B. Solly, and D. L. Harrison.
New Zealand Journal of Marine and Freshwater Research, Vol 6, No 4, p 456-62, December 1972. 1 fig, 2 tab, 10 ref.

Descriptors: *DDT, *DDD, *DDE, *Polychlorinated biphenyls, *Gas chromatography, Freshwater fish, Marine fish, Crayfish, Mussels, Oysters, Absorption, *Marine animals, Eels, Rainbow trout.
Identifiers: Sample preparation, Biological samples, *Lindane, Detection limits, *New Zealand, Recovery, Anguilla australis schmidtii, Anguilla diefenbachii, Polyprion oxygeneois, Rhombosolea plebeia, Salmo gairdneri, Parapercis colias, Sardinops neopilchardus, Jasus edwardsii, Perna canaliculus, Ostrea lutaria, Macroinvertebrates, Blue cod, Flounder, Pilchard, Groper.

Ten species of fish, crustaceans, and mollusks, taken from inland and coastal waters of New Zealand in 1969-70, mostly before the legislative ban on DDT, were analyzed for residues of lindane, polychlorinated biphenyls (PCB), and DDT and its metabolites. Samples were macerated, extracted, and analyzed by gas chromatography. The detection limit was 0.01 ppm and recoveries were 82 percent for DDE, 78 percent for DDD, 78 percent for DDT, 78 percent for lindane, and 95 percent for PCB. DDE was the only organochlorine compound detected in six species, and DDE was the major residue in all others. DDD and/or DDT was present only in eels (Anguilla australis schmidtii, A. diefenbachii), groper (Polyprion oxygeneois), and some flounder (Rhombosolea plebeia). No lindane or PCB was found in any of the samples. The range of total DDT levels in edible flesh was 0-0.20 parts per million (on a fresh tissue basis) and the mean residue level for all specimens was 0.02 ppm. The incidence of residues appeared to be related to the regional use of DDT. (Little-Battelle)
W73-12925

OPTICAL PROPERTIES AND COLOR OF LAKE TAHOE AND CRATER LAKE,
Scripps Institution of Oceanography, La Jolla, Calif.
R. C. Smith, J. E. Tyler, and C. R. Goldman.
Limnology and Oceanography, Vol 18, No 2, p 189-199, March 1973. 11 fig, 1 tab, 26 ref.

Descriptors: *Optical properties, *Color, Depth, *Light penetration, *Solar radiation, Physical properties, Secchi disks, *Oregon, *California, Upwelling, Water quality, Aquatic habitats, Aquatic environment, Water properties.
Identifiers: *Lake Tahoe, *Crater Lake, Spectroradiometer, Spectral irradiance, Seasonal variation.

Spectral irradiance has been measured as a function of depth in Crater Lake, Oregon and Lake Tahoe, California. In Lake Tahoe, Secchi disk observations and submarine photometer measurements have been recorded year round since July 1967 and beam transmittance has been measured as a function of depth. From these data the radiant energy input and certain optical properties of the two lakes are presented. Since color is a principal esthetic feature of these lakes, a complete color analysis is also presented. This information provides an objective standard with which to compare possible future changes in the optical properties and in the esthetic appearance of Crater Lake and Lake Tahoe. The method can be applied generally to quantify the optical deterioration of any aquatic habitat and can detect such deterioration before it is noticeable by casual visual observation. (Holoman-Battelle)
W73-12926

THORIUM IN WATER AND ALGAE FROM THE ADRIATIC SEA,
Institut Rudjer-Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
P. Strohal, and T. Pinter.
Limonology and Oceanography, Vol 18, No 2, p 250-253, March 1973. 2 tab, 20 ref.

Descriptors: *Sea water, *Chemical analysis, *Marine algae, *Neutron activation analysis, Heavy metals, Chlorophyta, Phaeophyta, Rhodophyta, Radiochemical analysis, Water analysis, Salinity, Methodology, Kelps, Radioactivity, Separation techniques, Radioactivity techniques.
Identifiers: *Thorium, *Adriatic Sea, Rare earth elements, Preconcentration, Pa-233, Sample preparation, Protactinium radioisotopes, Valonia utricularis, Cladophora pellucida, Codium dichotomum, Enteromorpha linza, Cystoseira barbata, Cytoseira abrotanifolia, Scytosiphon lomentaria, Padina pavonia, Halopteris scoparia, Calpomenia sinuosa, Dictyota dichotoma, Fucus virsoides, Ceramium rubrum, Vidalia volubilis, Rhodimenia palmeta.

Samples of seawater and algae collected along the coast of the Rovinj region in the North Adriatic were analyzed for the presence of thorium by neutron activation analysis (NAA). Thorium was preconcentrated by coprecipitation with Fe (OH)3, which was precipitated by the addition of FeC13 solution and NaOH to either filtered or unfiltered seawater. The samples were stirred well and Th separated from solution using Buchner vacuum filters or a centrifuge. The precipitate was dissolved in HC1, Fe removed by organic extraction, water phase evaporated, dried, irradiated and analyzed by NAA. Pa-233 radioactivities were measured in all samples and compared to standards. Samples of algae were measured, carefully separated, identified, and washed with seawater to remove impurities. The samples were slowly dried at 110 C, ignited at 450 C, reduced to constant weight, and analyzed by NAA as were the seawater samples. In filtered seawater, values were 0.8 pg Th/l and lower; for unfiltered seawater samples, values about three orders of magnitude higher were obtained. Thorium concentrations in marine algae are in the range of 1 to 0.01 microgram Th/g ashed material. (Holoman-Battelle)
W73-12927

CHEMISTRY AND TROPHIC STATUS OF SEVEN NEW ZEALAND LAKES,
Department of Scientific and Industrial Research, Taita (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 05C.
W73-12928

THE PHYSIOGNOMY AND STRUCTURE OF THE BENTHIC MACROPHYTE COMMUNITIES ON ROCKY SHORES IN THE SOUTHWESTERN ARCHIPELAGO OF FINLAND (SEILI ISLANDS),
Turku Univ. (Finland) Dept. of Botany.
O. Ravanko.
Nova Hedwigia, Vol 23, Nos 2-3, p 363-404, 1972. 23 fig, 22 ref.

Descriptors: *Biomass, *Marine plants, *Biological communities, *Benthic flora, Marine algae, Cyanophyta, Chlorphyta, Phaeophyta, Rhodophyta, Marsh plants, Water sampling, Sago pondweed, Kelps, Ditch grass, Monocots.
Identifiers: *Finland, *Macrophytes, *Physiognomy, *Marine environment, Vegetation profiles, Spermatophytes, Charophyta, Chaetomorpha, Enteromorpha, Ulothrix, Lithoderma, Mytilus edulis, Horned pondweed, Water milfoil, Sea grasses, Widgeon grass.

The physiognomy and structure of the benthic macrophyte communities on rocky shores in the southwestern archipelago of Finland (Seili Islands) have been studied. Rows of 1 sq m quadrats were marked out along 23 lines, their vegetation was mapped and the macrophytes were then harvested. The species were determined and belts were named according to the dominant species. The fresh and dry weights and the ash content of the material were determined. The vegetation can mostly be divided into three main belts: the Cladophora, Fucus and Potamogeton belts. Besides differing in species composition these three belts also differ in biomass. For comparison, the water and ash contents of some individual species were determined. The ash contents differ greatly between the species. Some taxonomic problems and sources of error in the research methods are treated. The extent to which the vegetation of the study area is typical of the southwestern archipelago of Finland is discussed, and some of the results are compared with those from other areas. (Holoman-Battelle)
W73-12929

ANALYTICAL REVIEWS 1973/APPLICATIONS.

Analytical Chemistry, Vol 45, No 5, pIR-403R, April 1973. 13080 ref.

Descriptors: *Analytical techniques, *Chemical analysis, *Air pollution, *Water pollution, *Reviews, *Methodology, *Documentation, *Pollutant identification, *Instrumentation, *Pollutants, Organic compounds, Inorganic compounds, Physical properties, Laboratory tests, Reliability, Chemical properties, Rdioactivity techniques, Onsite investigations, Radiochemical analysis, Water analysis.
Identifiers: Sample preparation, Collaborative studies.

The following are reviewed articles concerned with analytical methods that may be applicable to environmental studies: (1) Air Pollution by Peter K. Mueller and Evaldo L. Kothny, (2) Essential Oils and Related Products by Ernest Guenther, Gilbertson, and Roman T. Koenig, (3) Fertilizers by Charles W. Gehrke, Larry L. Wall, Sr., and Paul R. Rexroad, (4) Pesticide Residues by Wayne Thornburg, (5) Petroleum by Richard W. King, (6) Pharmaceuticals and Related Drugs by David W. Cornish, Daniel M. Grossman, Allen L. Jacobs, Arthur F. Michaelis, and Ben Salsitz, (7) Water Analysis by Marvin J. Fishman and David E. Erdmann, and (8) Food by James A. Yeransian, Katherine G. Sloman, and Arthur K. Foltz. (Holoman-Battelle)
W73-12930

DETERMINATION OF URANIUM IN URINE SPECIMENS FOLLOWING THEIR SEPARATION THROUGH ANION EXCHANGE, (BESTIMMUNG DES URANS IN URINPROBEN NACH DESSEN ABTRENNUNG DURCH ANIONENAUSTAUSCH),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkisch, and I. Steffan.
Mikrochimica Acta, p 273-278, March 1973. 2 tab, 4 ref.

Descriptors: *Urine, *Separation techniques, *Ion exchange, Heavy metals, Water analysis, Resins, Adsorption, Fluorometry.
Identifiers: *Uranium, Sample preparation, Detection limits.

A separation method that is generally applicable for uranium in the analysis of urine specimens is described. This is based on the adsorption of the uranium on the strongly basic anion exchanger Dowex 1, X8 from human urine that has been strongly acidified with hydrochloric acid, whereby most of the organic components, phosphoric acid and most mineral urine components are removed. Thus it becomes possible to separate the uranium compounds rapidly and simply without prior evaporation of the urine and destruction of the organic compounds. If need be, the foreign ions that are adsorbed along with the uranium, such as iron and also adsorbed urine coloring materials, are removed through subsequent washing of the resin with a mixture of 50 vol percent tetrahydrofurane, 40 vol percent methylglycol and 10 vol percent 6 N hydrochloric acid, and the uranium is eluted with 1 N hydrochloric acid. The determination of the uranium in the eluate can then be conducted without interference by the fluorometric method. (Little-Battelle)
W73-12931

DETERMINATION OF ALKYLBENZENESULFONATE (ABS) IN BOTTOM SEDIMENT,
Tokyo Metropolitan Univ., Tokyo. Dept. of Chemistry.
Y. Ambe.
Environmental Science and Technology, Vol 7, No 6, p 542-545, June 1973. 5 fig, 2 tab, 7 ref.

Descriptors: *Alkylbenzene sulfonates, *Bottom sediments, Lakes, Oceans, *Colorimetry, *Methodology, *Pollutant identification, Chemical analysis, Rivers, Water pollution, Separation, Techniques, Aquatic soils, Soil analysis, Mud, Solvent extractions, Detergents.
Identifiers: *Infrared spectrophotometry, Methylene blue active substance, Sample preparation, Chemical recovery, Dodecylbenzene sulfonate, Infrared spectra, Detection limits, Vertical distribution, Reproducibility, Lake Motosu, Lake Kizaki, Lake Aoki, Lake Shoji, Sagami Bay, Lake Suwa, Japan, Tokyo Bay, Absorbance.

A new method for the analysis of alkylbenzenesulfonate (ABS) in bottom sediments of a polluted river, a lake, and the sea was examined and the availability of the method was verified. Methylene blue active substance (MBAS) was extracted from dried mud sample with methanol benzene (1:1) mixture. After the solvent was completely evaporated, the residue was dissolved into distilled water and the concentration of MBAS was determined from the ratio of peak heights at wavenumber 1010/cm and at 890/cm of the infrared spectrum of MB-MBAS complex. Multiplying the value of MBAS by ABS/MBAS, the net content of ABS in the sediment was determined. Applying this method to the study of polluted lake sediments and marine sediments, some geochemical information on the process and rate of recent sedimentation in the lake and sea was obtained. (Holoman-Battelle)
W73-12932

SENSITIVITY AND DETECTABILITY LIMITS FOR ELEMENTAL ANALYSIS BY PROTON-INDUCED X-RAY FLUORESCENCE WITH A 3 MV VAN DE GRAAFF,
Los Alamos Scientific Lab., N. Mex.
C. J. Umbarger, R. C. Bearse, D. A. Close, and J. J. Malanify.
Available from the National Technical Information Service as LA-DC-72-1069. Report No. Conf-720801-2, 1972. 13 p, 4 fig, 1 tab, 13 ref.

Descriptors: *Heavy metals, *X-ray fluorescence, Titanium, Iron, Nickel, Copper, Gold, Lead.
Identifiers: *Sensitivity, *Detection limits, Proton-induced x-ray fluorescence, Proton accelerators, Vanadium, Germanium, Rubidium, Zirconium, Tin, Antimony, Cerium, Samarium, Dysprosium, Thulium, Tungsten, Bismuth, Thorium, Uranium, Silver.

Protons from a 3 MV Van de Graaff have been used to produce characteristic x-rays from 21 elements spanning the periodic table. The elements analyzed Ti, V, Fe, Ni, Cu, Ge, Rb, Zr, Ag, Sn, Sb, Ce, Sm, Dy, Tm, W, Au, Pb, Bi, Th, and U. Absolute K alpha and L alpha x-ray production cross sections have been determined, allowing one to calculate sensitivities for any given sample, detector geometry, and proton beam parameters. Elemental detectability limits are discussed assuming various backings and matrix materials. The large number of available small proton accelerators throughout the United States promises wide applicability of this technique to environmental and biomedical analysis. (Little-Battelle)
W73-12935

TRACE ELEMENT TRAPPING IN PTEROPOD TESTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-12937

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, OCTOBER, 1972,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05B.
W73-12945

A HYDROGRAPHIC ATLAS OF LARGER NORTH CAROLINA SOUNDS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 02L.
W73-12948

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-12949

SOLUBLE SILICA AND FLUORIDE IN SOME SURFACE AND GROUND WATERS OF MYSORE STATE,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
For primary bibliographic entry see Field 02K.
W73-12969

SIMULTANEOUS POLAROGRAPHIC DETERMINATION OF IRON (II) AND IRON (III) IN COAL MINE WASTE WATER,
Indiana Univ. of Pennsylvania. Dept. of Chemistry.
S. L. Tackett, and L. F. Wieserman.
Anal Lett. Vol 5, No 9, p 643-651. 1972. Illus.
Identifiers: Coal mine wastes, *Iron, *Mine waste water, *Polarographic determination, Waste waters.

Polarography with a sodium carbonate-oxalic acid supporting electrolyte was used to determine both Fe (II) and Fe (III) simultaneously in actual coal mine water samples. The average relative percent error was 2.2% for Fe (II) and 2.1% for Fe (III) over a range of 10-500 ppm. In actual mine water the Fe (II) content was highest where the mine water emerged. As the water moved down stream from the source of pollution Fe (II) decreased the Fe (III) concentration increased as Fe (II) was oxidized to Fe (III) by the O. This was accompanied by a decrease in pH. Further down the stream Fe (III) started to precipitate and then its concentration steadily decreased.--Copyright 1973, Biological Abstracts, Inc.
W73-12976

5B. Sources of Pollution

WATER QUALITY HYDROLOGY OF LANDS RECEIVING FARM ANIMAL WASTES,
Texas A and M Univ., College Station Water Resources Inst.
D. L. Reddell, G. G. Wise, R. E. Peters, and P. J. Lyerly.
Available from the National Technical Information Service as PB-222 181, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 50, June 1973, 110 p, 23 fig, 26 tab, 61 ref. OWRR A-015-TEX (1), 14-31-0001-3844.

Descriptors: *Farm wastes, Waste disposal, Water pollution sources, Nitrates, Denitrification, *Feed lots, *Texas, *Water quality, *Soil disposal fields, Path of pollutants.
Identifiers: Bellvile (Tex), Pecos (Tex), and El Paso (Tex).

A significant pollution potential from cattle manure has developed as a result of the cattle feeding industry progressing to large, high density feeding operations. The objectives of this study were to determine the characteristics of storm runoff from a beef feedlot and to evaluate the disposal of large amounts of manure on land. Feedlot runoff was found to carry large amounts of chemical elements. The concentrations of chemical elements did not vary with size and intensity of rainstorm as much as by topographic differences of the watersheds. More ammonia was volatilized from high pH soil columns than neutral pH soil columns. A total nitrogen loss of 10 to 20 percent occurred in the soil columns. Up to 900 tons/acre of manure can be safely plowed under 30 to 36 inches deep without creating a surface water pollution problem. An increase of salts in the groundwater occurred during the first year and then salts were reduced to initial values the second year. No nitrate pollution of groundwater occurred. Crops can be effectively grown on land receiving up to 900 tons/acre of manure. Peak yields occur the second and third year after plowing under. (Runkles-Texas)
W73-12353

ASPECTS OF THE BIOGEOCHEMISTRY OF CARBOHYDRATES AND PROTEINS IN AQUATIC ENVIRONMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W73-12371

PREDICTION OF MIXING LENGTHS FOR RIVER FLOW GAGING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
P. R. B. Ward.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9856, p 1069-1081, July 1973. 5 fig, 1 tab, 18 ref, append.

Descriptors: *Mixing, *Discharge measurement, *Tracers, Dispersion, Sampling, Radioactivity techniques, Radioisotopes, Stream gages, Path of pollutants.

An analytical solution of the diffusion equation determines criteria for use in river flow gaging by the dilution method. The method allows the mixing length to be predicted from the channel geometry. The mixing length is the distance required for tracer from a point injection to become mixed across the cross section. The mixing length depends mainly upon the ratio of the square of the breadth of channel to the mean depth. The mixing length calculated by this method is compared with the injection point to sampling point distances in successful flow gagings by various workers. (Knapp-USGS)
W73-12414

TRITIUM AND DEUTERIUM CONTENT OF THE SNOW IN GROENLAND,
L. Merlivat, J. Ravoire, J. P. Vergnaud, and C. Lorius.
Earth and Planetary Science Letters, Vol 19, No 2, p 235-240, June 1973. 7 fig, 2 tab, 13 ref.

Descriptors: *Snow, *Firn, *Tritium, *Deuterium, *Snowfall, Regimen, Water balance, Tracers, Sampling, Radioactive dating, Stable isotopes.
Identifiers: *Greenland.

Deuterium and tritium measurements were made on firn samples taken along a central axis across Greenland. Accumulation values determined from tritium profiles decrease regularly from 54.7 cm of water per year on the west coast to 18.1 cm of water per year on the east coast. A correlation is demonstrated between the tritium deposition rate and the altitude of the precipitation collection site. (Knapp-USGS)
W73-12418

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-12429

A TOPOLOGICALLY OPTIMUM RIVER SAMPLING PLAN FOR SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology.
W. E. Sharp.
Available from the National Technical Information Service as PB-222 278, $3.00 in paper copy, $1.45 in microfiche. Water Resources Research Institute, Clemson University, Clemson, S. C., Report No. 36, April 1973, 31 p, map, 5 fig, 4 tab, 9 ref. OWRR S-020-SC (1), A-026-SC (4).

Descriptors: *Water sampling, *Drainage patterns (Geologic), Monitoring, Water pollution sources, *South Carolina, Planning, Pollutant identification, Data collections.
Identifiers: *Edisto River (SC), Pee Dee River (SC), Santee River (SC), Savannah River (SC), *Topologically optimum plan, Sequential analysis.

A sequential river sampling plan has been developed which is independent of the shape of a drainage basin. Mathematical analysis indicates this sampling plan will be the optimum one in the search for a pollutant coming from a single source. The procedure consists of sequential sampling at successive centroids of the river basin such that only the contaminated portion is followed after each step. The site selection for all possible source locations need only be performed once using standard river basin maps. This selection has been performed for all river basins in South Carolina and the results are summarized on a composite drainage map of the State. The map shows that under ideal circumstances no more than 11 sequential samples would be needed to locate a unique pollution source on any of the rivers of South Carolina. Many practical problems require that a simultaneous sampling plan be used and for this purpose the necessary sampling sites can be selected quickly from among the sites already marked on the map as sequential sites. These sites are uniformly distributed and a 50% sequential coverage of the state is possible using a simultaneous plan of only 81 sites. These have been listed in order of priority and their locations are specified in terms of road numbers where highway bridges are closest to each site.
W73-12498

NUMERICAL THERMAL PLUME MODEL FOR VERTICAL OUTFALLS IN SHALLOW WATER,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
D. S. Trent, and J. R. Welty.
Copy available from GPO Sup Doc as EP1.23/2:73-162, $4.80; microfiche from NTIS as PB-221 488, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-162, March 1973. 486 p, 115 fig, 12 tab, 113 ref.

Descriptors: Waste disposal, *Turbulent flow, Jets, Temperature, *Thermal pollution, *Heated water, Forecasting, Model studies, *Outlets, Water pollution sources, Path of pollutants.
Identifiers: *Waste heat disposal.

A theoretical study of the heat and momentum transfer resulting from a flow of power plant condenser effluent discharged vertically to shallow, quiescent coastal receiving water is presented. The complete partial differential equations governing steady, incompressible, turbulent flow driven by both initial momentum and buoyancy are solved using finite-difference techniques to obtain temperature and velocity distributions in the near field of the thermal discharge. Turbulent quantities were treated through the use of Reynolds stresses with further simplification utilizing the concept of eddy diffusivities computed by Prandtl's mixing length theory. A Richardson number correlation was used to account for the effects of density gradients on the computed diffusivities. Results were obtained for over 100 cases, 66 of which are reported, using the computer program presented in this manuscript. These results ranged from cases of pure buoyancy to pure momentum and for receiving water depths from 1 to 80 discharge diameters deep. Various computed gross aspects of the flow were compared to published data and found to be in excellent agreement. Data for shallow water plumes and the ensuing lateral spread are not readily available; however, one computed surface temperature distribution was compared to proprietary data and found also to be in reasonable agreement. (EPA)
W73-12506

HERBICIDE CONTAMINATION OF SURFACE RUNOFF WATERS,
Utah State Univ., Logan. Dept. of Plant Science.
J. O. Evans, and D. R. Duseja.
Copy available from GPO Sup Doc as EP1.23/2 73-266, $1.25; microfiche from NTIS as PB-222 283, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-266, June 1973. 99 p, 14 fig, 22 tab, 62 ref. EPA Project 13030 FDJ.

Descriptors: *Herbicides, *Weed control, Water pollution sources, Persistence, Urea pesticides, Triazine pesticides, 2-4-D, 2-4-5-T, *Return flow, Path of pollutants, Water quality control.
Identifiers: *Herbicide runoff, *Picloram adsorption, Picloram leaching, Herbicide residues, Herbicide adsorption, Canal bank weed control, Diuron, Picloram.

Field and laboratory studies of the movement of herbicides were conducted to determine their potential as contaminants in irrigation return flow. Special emphasis was given to the use of herbicides for vegetation control along ditches, canals and watersheds where high dosages are required to control the excessive growth of grasses and broadleaved weeds. The following herbicides have been studied: substituted urea (diuron), triazines (summitol and atrazine), phenoxyacetic acid (2,4-D and 2,4,5-T) and a substituted pyridine (picloram). The greatest tendency for transport of herbicides in water coming in contact with soils occurs during the initial storms following spray application. If the intensity of the initial precipitation is not sufficient to cause movement across the soil, the danger of herbicide movement is essentially eliminated. The highest concentrations (ppm) of herbicide observed in surface waters were 1.8, 0.5, 4.2, 1.2 and 2.7 for diuron, summitol, 2,4-D, 2,4,5-T and picloram, respectively. These levels were observed immediately below treated areas receiving the higher recommended dosages of the herbicides. All herbicide concentrations dropped below the limit of detection within a few hundred meters below the sprayed areas. Presumably, soil filtration, adsorption and dilution are primarily responsible for the loss of herbicides from water. (EPA)
W73-12511

AN INVESTIGATION OF THE NITRATE PROBLEM IN RUNNELS COUNTY, TEXAS,
Texas Water Development Board, Austin; and Radian Corp., Austin, Tex.
D. C. Jones.
Copy available from GPO Sup Doc as EP1.23/2:73-267, $2.60; microfiche from NTIS as Pb-222 176, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-267, June 1973. 214 p, 22 fig, 10 tab, 43 ref. EPA Project 16060 HNI.

Descriptors: Groundwater, *Nitrates, Water pollution sources, *Stable isotopes, Soil contamination, Soil chemical properties, Soil leaching, *Remote sensing, Aerial photography, Aquifer characteristics, *Texas.
Identifiers: *Groundwater pollution, *Nitrogen isotope ratio, *Infrared photography, Groundwater age dating.

This report describes the investigation of the nitrate contamination in Runnels County, Texas. It was found that most water well contamination is due to naturally occurring nitrate. However, all the very high nitrate contamination problems (>1000 ppm) are principally due to nitrate from barnyards. The nitrate sources were confirmed utilizing the nitrogen isotope ratio technique. The nitrate contamination was caused by a rising water table which intersected and dissolved nitrate deposits from the soil. The rising water table was caused by a combination of low porosity aquifers, increased infiltration (decreased surface runoff) due to terracing, and several consecutive years of above normal rainfall. There appears to be no economical way to remove the nitrate from either the water or the soil. Recommendations for ways for the area residents to obtain potable water and for a continued monitoring program are included. (EPA)
W73-12514

GROUND WATER POLLUTION IN THE SOUTH CENTRAL STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Ground Water Research Program.
M. R. Scalf, J. W. Keeley, and C. J. LaFevers.
Copy available from GPO Sup Doc as EP1.23/2:73-268, $2.35; microfiche from NTIS as PB-222 178, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-268, June 1973. 181 p, 23 fig, 15 tab, 385 ref. EPA Project No. 21 A10-03.

Descriptors: *Groundwater, *Water pollution sources, Water resources, Pollution, Oil fields, Brines, Pumping, *Reviews, Bibliographies, *Salinity, Water quality, *Brine disposal, *Waste disposal, Arkansas, Louisiana, New Mexico, Oklahoma, Texas.
Identifiers: *South-central US, Natural pollution.

A study was conducted to determine the groundwater pollution problems in the states of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. Information was obtained through review of the literature and through interviews with engineers, scientists, and governmental officials concerned with water pollution in the five states of the project area. Natural salinity was the greatest factor affecting the quality of ground water of the region. Disposal of oil-field brines was the most widespread source of man-made pollution. Other causes of groundwater pollution included poor well construction and abandonment procedures, over-pumping, irrigation return flows and land disposal of solid and liquid wastes. (EPA)
W73-12515

OPTIMUM CONDITIONS FOR THE DISCHARGE OF PAPER INDUSTRY EFFLUENTS (OPTIMAL'NOE VODOOTVEDENIE STOKOV BUMAZHNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
For primary bibliographic entry see Field 05G.
W73-12547

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12553

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05A.
W73-12554

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05C.
W73-12555

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12557

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. C. CHEMICAL PROCESSES, GENERAL OBSERVATIONS, AND REPORTS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12558

LEAD POLLUTION: RECORDS IN SOUTHERN CALIFORNIA COASTAL SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
T. J. Chow, K. W. Bruland, K. Bertine, A. Soutar, and M. Koide.
Science, Vol 181, No 4099, p 551-552, August 10, 1973. 2 fig, 8 ref. USAEC Grant AT (04-3)-34; NSF Grant GA-26301.

Descriptors: *Path of Pollutants, *Lead, *California, *Bottom sediments, Coastal plains, Heavy metals, Sedimentation, Sedimentation rates.

The present lead fluxes into sediments from the Santa Monica, San Pedro, and Santa Barbara basins of Southern California are, respectively, 0.9, 1.7, and 2.1 micrograms of lead per square centimeter of sea bottom per year; the natural (prepollution) rates for these three basins were, respectively, 0.24, 0.26, and 1.0 microgram of lead per square centimeter per year. Studies of isotopic composition indicate that lead pollutants in coastal sediments are derived mainly from the combustion of lead additives in gasoline. (Knapp-USGS)
W73-12589

LONG-LIVED POLLUTANTS IN SEDIMENTS FROM THE LAGUNA ATASCOSA NATIONAL WILDLIFE REFUGE, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
W. M. Ahr.
Geological Society of America Bulletin, Vol 84, No 8, p 2511-2516, August 1973. 4 fig, 11 ref.

Descriptors: *Pesticides, *Path of pollutants, *Lagoons, *DDT, *Texas, Bottom sediments, Pesticide kinetics, Clays, Benthos, Persistence, Pesticide residues, Gulf of Mexico.

DDT and some heavy metals are long-lived pollutants which may be retained in sedimentary layers and may be relocated by postdepositional biological or mechanical processes. Because DDT has a half life of up to 17 yr and it is concentrated in higher ecological levels, even a few parts per billion in the sedimentary substrate can be harmful to wildlife. The Laguna Atascosa National Wildlife Refuge is surrounded by croplands that have been treated extensively with pesticides. Located on the flanks of the Rio Grande delta, the area has ponds, lakes, streams, and lagoons, all of which become settling basins for contaminated sediments. DDT is most abundant near the tops of the core samples and it may be enriched in subsurface clayey layers. Therefore, postdepositional processes have relocated the DDT into secondary host strata. The relocation is attributed to burrowing and mixing by crabs, worms, and other organisms. (Knapp-USGS)
W73-12595

HEAVY METALS IN THE ENVIRONMENT.
Proceedings of Seminar Conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, January 1973. 203 p. OWRR A-999-ORE (14).

Descriptors: *Heavy metals, *Water pollution sources, *Water pollution effects, *Public health, *Conferences, Environmental effects, Air pollution, Trace elements, Water chemistry, Chemical reactions, Toxicity, Hazards, Poisons, Ecology, Ecosystem, Food chains, Human pathology, Animal pathology, Biota.
Identifiers: *Symposium (Oregon State Univ), Pollution tolerance.

To examine pollution of the environment by metals, a seminar series was held at Oregon State University during fall quarter 1972. The seminars were open to the public, faculty, and students. Representatives of federal and state agencies were in attendance. The lectures are reproduced in this volume. The title and author of each paper presented are: Environmental Contamination by Toxic Metals, by D. R. Buhler; Heavy Metals in Estuaries and the Coastal Zone, by N. H. Cutshall; Arsenic and Cadmium in the Environment, by S. L. Wagner; Problems in the Analysis of Trace Metals, by R. H. Filby; Transport of Heavy Metals Through the Air Environment by S. K. Friedlander; Health Standards for Metals in Drinking Water, by R. G. Tardiff; Effect of Heavy Metals on Fish, by G. Chapman; Effects of Metals on Fertilization and Development in Fish, by J. D. McIntyre; The Role of Heavy Metals in Biology, by F. S. Kennedy; and Selenium in the Environment, by P. H. Weswig. (See W73-12605 thru W73-12614) (Woodard-USGS)
W73-12604

ENVIRONMENTAL CONTAMINATION BY TOXIC METALS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
D. R. Buhler.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 1-35, January 1973. 1 fig, 7 tab, 23 ref.

Descriptors: *Heavy metals, *Environmental effects, *Toxicity, *Water pollution sources, *Public health, Air pollution, Ecology, Trace elements, Hazards, Poisons, Ecosystems, Food chains, Pathology.
Identifiers: *Pollution effects.

Concern over environmental pollution by heavy metals has developed because: (1) these elements are widely distributed throughout the environment; (2) they are not degraded and hence persist in nature for extended periods of time; (3) generally, they are toxic to living organisms at fairly low concentrations; (4) they tend to be either biologically magnified or cumulative in plants and animals; and (5) certain metals can be converted to more toxic forms in the environment. While contamination by toxic metals probably affects the entire biota, most attention has focused on the potential risk of metals to man. Metals thought to have adverse effects on human health are summarized. The most hazardous of these metals are arsenic, beryllium, cadmium, lead, mercury, nickel, and selenium. Regardless of the source, most metallic wastes eventually end up in surface and subsurface waters. Liquid wastes containing toxic metals are produced in many industrial operations. In addition to the direct discharge of such wastes, large quantities of many metals which are released into the atmosphere by industrial plants, incinerators, automobiles, etc., are eventually found as water pollutants after sedimentation or after precipitation from the air in rain or snow. (See also W73-12604) (Woodard-USGS)
W73-12605

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE,
Oregon State Univ., Corvallis. School of Oceanography.
N. H. Cutshall.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 37-44, January 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Water pollution sources, *Estuaries, *Heavy metals, *Coasts, *Path of pollutants, Pollution effects, Ecosystems, Ecology, Ecological distribution, Food chains, Trace elements, Bottom sediments, Biota.

Heavy metals normally occur at very low concentrations in coastal waters. Thus the addition of relatively small quantities of these elements to estuaries can potentially affect the concentrations. As an extreme example, the concentration of beryllium is only 6 x 10 to the minus 8th power grams per liter in seawater. This amounts to about half a cubic foot of the metal in the 200-mile-long Chesapeake Bay, the largest estuary in the United States. Low concentrations of heavy metals in solution are a result of their tendency for sorption on particulate matter including suspended sediment, bed sediment, and small organisms. In some cases, active removal of metals from the water by organisms may also contribute to lowered concentrations in the water. The transport and dilution of heavy metals in coastal systems is therefore affected by the movement of particulate matter as well as by the flow of water. The influence of initial sorption of metals upon their subsequent availability to organisms is one of the most significant problem areas in environmental research. Discussed is the effectiveness of sediments at detoxifying contaminated waters, and the conditions and the degree to which metals in sediments will become incorporated into the biosphere. (See also W73-12604) (Woodard-USGS)
W73-12606

ARSENIC AND CADMIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 05C.
W73-12607

PROBLEMS IN THE ANALYSIS OF TRACE METALS,
Washington State Univ., Pullman. Nuclear Radiation Center.
For primary bibliographic entry see Field 05A.
W73-12608

TRANSPORT OF HEAVY METALS THROUGH THE AIR ENVIRONMENT,
California Inst. of Tech., Pasadena.
S. K. Friedlander.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 81-112, January 1973. 9 fig, 2 tab, 20 ref.

Descriptors: *Air pollution, *Heavy metals, *Chemical analysis, Chemical reactions, Atmosphere, Condensation, Evaporation, Coagulation, Sedimentation, Correlation analysis, Model studies, Aerosols, Particle size, Water pollution sources.

A method has been developed for calculating the number and chemical element size distributions of aerosols in a polluted atmosphere based on measured source characteristics and a chemical element balance for collected aerosol samples. The method assumes that: (1) no interaction occurs among primary aerosol emissions, (2) certain simplified models can be used to account for the conversion of secondary sources to the particulate phase, and (3) no modification of the primary emission size distributions occurs except through dilution and the secondary conversion processes. The method has been applied to the Pasadena aerosol and good agreement obtained with measured size and chemical element distributions. (See also W73-12604) (Woodard-USGS)
W73-12609

HEALTH STANDARDS FOR METALS IN DRINKING WATER,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05G.
W73-12610

EFFECT OF HEAVY METALS ON FISH,
National Environmental Research Center, Corvallis, Oreg. Western Fish Toxicology Station.
For primary bibliographic entry see Field 05C.
W73-12611

EFFECTS OF METALS ON FERTILIZATION AND DEVELOPMENT IN FISH,
Oregon Cooperative Fishery Unit, Corvallis.
For primary bibliographic entry see Field 05C.
W73-12612

THE ROLE OF HEAVY METALS IN BIOLOGY,
Harvard Medical School, Boston, Mass.
For primary bibliographic entry see Field 05C.
W73-12613

SELENIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05C.
W73-12614

NUTRIENTS IN NEBRASKA'S WATERS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
J. Muir, S. Boyce, E. C. Seim, and R. A. Olson.
Farm, Ranch and Home Quarterly, Summer 1973. 3 p, 2 fig. OWRR B-022-NEB (1). 14-31-0001-3908.

Descriptors: *Fertilizers, *Nutrients, *Nitrogen, *Phosphorus, Agricultural chemicals, *Nebraska.

A broad research program is determining the nutrient status and sources of nutrients in Nebraska waters with particular reference to agriculture's role, especially fertilizer use. Basic objectives are to investigate movement of N and P below the root zone under different agricultural management systems. Surface and rain waters also are surveyed relative to these nutrients. Essentially no change in P concentration of groundwater occurred in the 1961-72 period. This is not surprising since even soluble P compounds in fertilizers are rapidly rendered immobile in the soil. Studies indicate that the nutrient content of the groundwater is predominantly related to irrigation and water table depth. In effect, the more irrigation development and the shallower the water table, the greater the nutrient content, accentuated further if soils in the area are largely of sandy texture. Of significant but somewhat lesser import is the magnitude of fertilizer use and of cattle density, with essentially no impact of human density.
W73-12615

DEGRADATION OF METHYLMERCURY BY BACTERIA ISOLATED FROM ENVIRONMENTAL SAMPLES,
Midwest Research Inst. Kansas City, Mo.
For primary bibliographic entry see Field 05A.
W73-12620

SELECTIVE SUBSTRATE UTILIZATION BY MARINE HYDROCARBONOCLASTIC BACTERIA,
Naval Weapons Center, China Lake, Calif. Michelson Labs.
G. Soli, and E. M. Bens.
Biotechnology and Bioengineering, Vol 15, No 2, p 285-297, March 1973. 2 fig, 4 tab, 4 ref.

Descriptors: *Biodegradation, *Marine bacteria, *Oxidation, Oil spills, Oil, Organic compounds, Gas chromatography, Classification, Microbial degradation.

Identifiers: *Crude oil, Substrate utilization, Paraffins, Normal paraffins, Isoparaffins, Aromatic hydrocarbons, Cycloparaffins, Chromatograms, Decalin, Tetralin, 1 3 5-triethylbenzene, Tridecane, 1 3 5-triisoproplybenzene, Bicyclohexyl, Heptylcyclohexane, Farasane, Tetradecane, 2-Ethylnaphthalene, Pentadecane, 1 2-Dimethylnaphthalene, Acenaphthene, Hexadecane, 2 3 6-Trimethylnaphthalene, Flourene, Pristane, Octadecane, Anthracene, Eicosane, Fluoranthene, Pyrene, Tetracosane, Pentacosane, Hexacosane, Squalane, Octacosane, Triasontane.

Several strains of bacteria, isolated from marine environments, were characterized by gas chromatography for their hydrocarbon oxidizing abilities using a complex synthetic mixture of hydrocarbons. Attempts were made at a broad classification of these organisms on the basis of their behavior towards four major groups of hydrocarbons, normal paraffins, iso-paraffins, cyclo-paraffins, and aromatics, known to be present in crude oils. Although bacteria appear to be able to oxidize hydrocarbons at random, this study has shown that it may be possible to recognize a rudimental pattern if their oxidative abilities are viewed in terms of groups of hydrocarbons rather than individual compounds. The action of combined strains on the synthetic hydrocarbon mixture was studied. No particular benefit could be derived as compared to the use of single strains. (Little-Battelle)
W73-12621

PREPARATION AND PROPERTIES OF 3--TRIFLUOROMETHYL-4-AMINOPHENOL,
Medical College of Wisconsin, Milwaukee. Dept. of Pharmacology.
J. J. Lech.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 461-463, March 1973. 2 fig, 2 tab, 3 ref.

Descriptors: *Physiochemical properties, *Methodology, Larvicides, *Phenolic pesticides, Gas chromatography, Halogenated pesticides, Organic compounds, Phenols, Spectrophotometry.
Identifiers: :±Trifluoromethyl-4-aminophenol, Preparation (Chemical), Dissociation constants, Infrared spectra, Metabolites, Ultraviolet spectra, Chemical composition, Thin layer chromatography, Ultraviolet spectrophotometry, pK, Electron capture gas chromatography, 3-Trifluoromethyl-4-nitrophenol.

A method is described for the preparation of 3-trifluoromethyl-4-aminophenol (RTFM), metabolite of 3-trifluoromethyl-4-nitrophenol (TFM), a selective larvicidal agent used to control the sea lamprey (Petromyzon marinus) in the upper Great Lakes. Some of its physical-chemical properties, including infrared spectrum pK sub a, and gas chromatography, were examined which may aid in the design of analytical procedures for metabolite residues. Generally, the metabolite is prepared from the parent compound by reduction with hydrogen by: (1) dissolving TFM in absolute ethanol to which was added 5 percent palladium on charcoal, (2) reducing the chemical in a Parr apparatus at 60 psi H2, (3) filtering to remove the catalyst, and bubbling HC1 gas through the mixture in an ice bath, and (4) collecting the precipitate by vacuum filtration and washing with ice-cold acetone. The resulting material dried under vacuum and stored under nitrogen is a white fluffy powder which decomposed at 210-220C. Elemental analysis indicated that this material contained 39.19 percent C, 26.95 percent F, and 3.28 percent H. (Holoman-Battelle)
W73-12622

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF LAKES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.

W73-12624

BIOLOGICAL ASPECTS OF LEAD: AN ANNOTATED BIBLIOGRAPHY - LITERATURE FROM 1950 THROUGH 1964. PARTS I AND II,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 05C.
W73-12627

THE EFFECT OF ADSORBENTS ON THE RATE OF DEGRADATION OF HERBICIDES INCUBATED WITH SOIL,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
J. R. Moyer, R. J. Hance, and C. E. McKone.
Soil Biol Biochem. Vol 4, No 3, p 307-311. 1972.
Identifiers: *Adsorbents, *Degradation rate (Herbicides), *Herbicides, Incubation, *Soils.

The rate of disappearance was followed of atrazine, chlorthiamid and linuron when incubated at 20C with soil and soil containing added charcoal or clay. The presence of clay slightly increased (7.5-38%) the persistence of all compounds, whereas charcoal although increasing the persistence of atrazine and chlorthiamid several fold did not significantly affect that of linuron. Charcoal reduced decomposition rates less than it reduced herbicide concentration in the soil solution.--Copyright 1973, Biological Abstracts, Inc.
W73-12656

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-1

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I, PRODUCT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-2

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION II, CHEMICAL INGREDIENT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-3

THE KINETICS OF MICROBIOLOGICAL MODIFICATION OF ORGANIC SUBSTANCES IN NATURAL WATERS,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button.
Alaska Institute of Water Resources Report No. 11, December 1972. 9 p, 1 tab, append. OWRR A-023-ALAS (1).

Descriptors: *Metabolism, *Microorganisms, *Water chemistry, *Decomposing organic matter, Hydrogen ion concentration, Nutrients, Kinetics, Organic matter, Biochemistry, Absorption, Water purification.
Identifiers: Nutrient removal.

The threshold quantity above which the process of the metabolizing of foreign chemicals in water can occur is set by the facility with which the cellular membranes involved can concentrate the material in question. This process is accomplished by diffusion accompanied by a set of transport systems which recognize a particular species and carry it across the cell wall where it is chemically modified. Since microbial decomposition is a major route or organic material decomposition and the reason dissolved organics do not accumulate, understanding this process is basic to understanding water chemistry. Research yielded several broad generalizations, the most important of which are that substances in small quantities such as vitamins are effectively removed; sediments (clay and glacial flour) do not appreciably affect dissolved nutrient availability; and nutrient removal can be fairly well predicted by a simple, empirically derived equation, justified on the basis of bimolecular collision frequency in liquids. Also, a consistent and unusual response of transport to pH was found. It is the efficiency of this transport system that sets the levels of dissolved metabolites that are kinetically important. A shift of 2 pH units can shut off this process showing that pH is a more important variable than heretofore realized. (Jones-Wisconsin)
W73-12712

THE EFFECT OF LONGITUDINAL DISPERSION ON THE DEOXYGENATION RATE IN POLLUTED STREAMS,
Hydraulic Research Inst., Prague (Czechoslovakia). Surface Water Quality Div.
A. Nejedly.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1601-1605, July 1973. 3 fig, 2 tab, 7 ref.

Descriptors: *Dispersion, *Oxygen sag, *Path of pollutants, Dissolved oxygen, Waste assimilative capacity.
Identifiers: Deoxygenation.

The ratios between stream and laboratory values of the deoxygenation coefficient in two polluted streams were compared with the respective values of the coefficient of longitudinal dispersion as determined by tracer tests. Stream values are consistently higher than laboratory values, and the ratio between stream and laboratory values of the deoxygenation coefficient at the same temperature is directly proportional to the coefficient of longitudinal dispersion. The general form of the relationship between the ratio of the stream value of the deoxygenation coefficient at an arbitrary temperature versus its laboratory value at 20 deg C and the value of the coefficient of longitudinal dispersion was established and formulated. (Knapp-USGS)
W73-12714

MINERAL POLLUTION IN THE COLORADO RIVER BASIN,
Environmental Protection Agency, Phoenix, Ariz. Colorado River Basin Water Quality Control Project.
W. C. Blackman, Jr., J. V. Rouse, G. R. Schillinger, and W. H. Shafer, Jr.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1517-1557, July 1973. 24 fig, 14 tab, 19 ref.

Descriptors: *Salinity, *Water pollution sources, *Colorado River, Irrigation water, Leaching, Salts, Runoff, Chlorides, Bicarbonates.

Concentrations of total dissolved solids (salinity) in Colorado River basin streams are a major problem for lower basin water users. Salinity concentrations in unregulated streams of the basin comprise two distinct populations that are grouped into base flow months and runoff months. Statistically significant increases in salinity have occurred with increasing water use, and in downstream progression. Upper basin salt load contributions are: runoff, 52 percent; irrigated agriculture, 37 percent; natural point sources and flowing wells, 9 percent; and municipal and industrial, 7 percent. Lower basin contributors are: upper basin inflow, 72 percent; natural point sources, 15 percent; irrigated agriculture, 9 percent; runoff, 4 percent, and municipal and industrial, less than 1 percent. Salt yields from irrigated lands range from near 0 to 8.5 tons/yr/acre. Greatest yields are from irrigation of and runoff from lands underlain by Mancos shale and Tertiary lake beds. Headwater areas yield predominantly calcium bicarbonate waters. Saline sediments in lower valleys cause waters to become predominantly high in sodium calcium sulfate ions. (Knapp-USGS)
W73-12715

FACTORS AFFECTING THE PERCOLATION TEST,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
K. A. Healy, and R. Laak.
Journal Water Pollution Control Federation, Vol 45, No 7, p 1508-1516, July 1973. 10 fig, 2 tab, 5 ref.

Descriptors: *Infiltration, *Percolation, *Septic tanks, Soil disposal fields.
Identifiers: *Percolation tests.

A mathematical analysis of the percolation test is presented with both capillary and gravity flow potentials considered. A relation between percolation rate, capillarity, hole shape, and permeability is developed. Laboratory percolation tests qualitatively support the analysis. Field percolation tests show no correlation between percolation rate, permeability, or position of the water table. The percolation test seems to be an unreliable method of determining the water absorption capability of a soil deposit. (Knapp-USGS)
W73-12716

LIPIDS IN SHALLOW BOTTOM SEDIMENTS,
Harvard Univ., Cambridge, Mass. Dept. of Chemistry.
D. G. Shaw.
Environmental Science and Technology, Vol 7, No 8, p 740-742, August 1973. 1 fig, 8 ref.

Descriptors: *Bottom sediments, *Estuaries, *Massachusetts, *Lipids, Harbors, Organic compounds, Oil wastes, Oil spills, Path of pollutants, Water pollution sources, Adsorption, Waste water (Pollution), Sewage sludge, Distribution patterns.
Identifiers: *Boston Harbor.

Sediments from the bottom of Boston Harbor and vicinity were analyzed for lipids by gas chromatography. A petroleum-like fraction was associated with sewage sludge dumped into the harbor and with bottom deposits of similar sludge-like mud. However, samples of silt and clay collected in adjacent areas showed no evidence of petroleum at comparable concentrations. The difference in lipid content of the various sediments reflects the complexity of estuarine sedimentation processes and are absorption of organic materials onto sediments. (Knapp-USGS)
W73-12717

PREDICTION OF UNSTEADY SALINITY INTRUSION IN ESTUARIES: MATHEMATICAL MODEL AND USER'S MANUAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-12728

PROBLEMS OF GROUNDWATER POLLUTION BY BRINE,
Public Health Service, Dallas, Tex. Region VII.
J. W. Keeley.
Public Works, Vol 97, No 3, p 149, 158, 160, 162, March 1966.

Descriptors: *Water pollution sources, Pollution, Wells, *Waste water disposal, *Brine disposal, Aquifers, Oil wells, Injection wells.
Identifiers: Well sealing, Cementing, *Surface pits.

Numerous complaints have been registered concerning salt water pollution in rural water wells, and there is growing concern for the protection of major aquifers from which municipal water supplies are drawn. Described is the development of procedures which can be extended from an area of investigation to the entire problem area by interested parties. These procedures help to determine methods by which brine pollution sources and polluted water sources can be located, point out threatened fresh water sources that need protection, find ways to properly seal old and new wells, and present information and advice upon which state agencies can prepare necessary legislation for the prevention of brine pollution. (Campbell-NWWA)
W73-12770

NEW APPLICATIONS OF GEOPHYSICAL METHODS TO GROUND-WATER PROBLEMS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 02F.
W73-12783

BIOLOGICALLY ACTIVE COMPOUNDS IN THE AQUATIC ENVIRONMENT: THE UPTAKE AND DISTRIBUTION OF (1,1-DICHLORO-2-,2-BIS (P-CHLOROPHENYL) ETHYLENE), DDE BY CHIRONOMUS TENTANS FABRICIUS (DIPTERA: CHIRONOMIDAE),
Michigan State Univ., East Lansing. Dept. of Entomology.
S. K. Derr, and M. J. Zabik.
Trans Am Fish Soc. Vol 101, No 2, p 323-329. 1972. Illus.
Identifiers: Aquatic enviroment, *Chironomidae, Chironomus-Tentans, *DDE, Diptera, Distribution patterns, *Midges.

The midge, C. tentans was exposed from egg through adult to varying concentrations (.07-2.2 ppb) of (1,1-dichloro-2,2-bis (P-chlorophenyl) ethylene), DDE. The amount of DDE accumulated by the midge was determined by gas-liquid chromatography. The accumulation of DDE from aqueous solution and contaminated substrate by the midge as a function of DDE concentration and exposure time was determined, and the distribution of the accumulated DDE residue was quantitated (pupa, exuvia, adult and egg mass). No attempt was made to differentiate between these 2 modes of uptake (water or substrate). The DDE accumulation by the midge demonstrated a dose-dependent relationship, accumulating DDE exponentially with increased concentration at a given exposure time. At any given concentration of DDE in the water, accumulation increased with increased exposure time. On a ppm basis the midges concentrated DDE approximately 20,000 times over that level which was present in the water. The exuvia did not demonstrate a major route of residue elimination as only 1.4 to 4.9% of the pupal burden was lost via the exuviae. The process of egg deposition eliminated 11.6 to 30.9% of the adult female burden of DDE residue.--Copyright 1973, Biological Abstracts, Inc.
W73-12804

MERCURY LEVELS IN WISCONSIN FISH AND WILDLIFE,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05A.
W73-12812

PHOTOSULFOXIDATION OF HYDROCARBONS IN THE LIQUID PHASE,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 02K.
W73-12833

DDT RESIDUES IN WHITE CROAKERS,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 05C.
W73-12835

THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W73-12843

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W73-12846

FLOW OF MICROBIALLY FIXED NITROGEN IN A MODEL ECOSYSTEM,
Oak Ridge National Lab., Tenn.
S. A. Visser, M. Witkamp, and R. C. Dahlman.
Plant and Soil, Vol 38, No 1, p 1-8, February 1973. 3 fig, 1 tab, 6 ref.

Descriptors: *Nitrogen fixation, *Azotobacter, *Nitrogen fixing bacteria, *Path of pollutants, Nitrification, Ecosystems, Mass spectrometry, Computer models, Cycling nutrients, Nitrogen, Aquatic plants, Cultures, Kaolinite, Centrifugation, Incubation, Clays, Anaerobic conditions, Nitrogen cycle, Radioactivity techniques.
Identifiers: Fate of pollutants, Culturing techniques, Acidification, Duckweed, Kjeldahl procedure, Nitrogen radioisotopes, Azotobacter chroococcum, Culture media.

Transfer of atmospheric nitrogen through microbial fixers, a green plant, decomposer microflora, water and soil was measured in model ecosystems. The systems were maintained under controlled conditions in a 50-ml respirometer flask and consisted of 10 g of kaolinite, 10 ml of water, 60 duckweed leaves (Lemna minor), and a mixed microflora or pure Azotobacter chroococcum. The role of the Azotobacter in fixation was assessed by comparing the nitrogen flow in systems with nitrogen fixers only and those with both nitrogen fixers and decomposers. Analog computer simulations were used to compare N-15 transfer from the atmosphere with net changes of all nitrogen in all compartments. Results showed that Azotobacter and the mixed flora with Azotobacter are about equally capable of fixing atmospheric nitrogen. During subsequent transfer of the nitrogen there was a distinct differentiation between movement of the newly fixed nitrogen and the nitrogen that was already present in tissues introduced in the beginning of the experiment. Pathways and transfer coefficients of both N-14 and N-15 were different in the presence of the different microbial populations. Turnover was more complex and in general slower in the presence of a mixed population than with pure Azotobacter. Denitrification losses upon adicification were negligible for N-14 but appreciable for N-15. (Mortland-Battelle)
W73-12847

AROMATIC HYDROXYLATION AS AN ANALYTICAL REACTION,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05A.
W73-12853

PARTICULATE MANGANESE IN SEA WATER STRESSING REGIMES IN MARINE ANOXIC BASINS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05A.
W73-12854

NITROGEN RELEASE FROM LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
E. R. Austin, and G. F. Lee.
Journal Water Pollution Control Federation, Vol 45, No 5, p 870-879, May 1973. 7 fig, 4 tab, 10 ref.

Descriptors: *Lake sediments, *Nitrogen, *Nitrogen compounds, Anaerobic conditions, Aerobic conditions, Mixing, Shallow water, Deep water, Laboratory tests, *Wisconsin, Nitrates, Nitrites, Trophic level, Oligotrophy, Mesotrophy, Bottom sampling, Bottom sediments, Ammonia.
Identifiers: *Lake Mendota, *Lake Trout, *Nitrogen release, Chemical composition, Kjeldahl nitrogen, Ammonium, Ekman dredge, Organic nitrogen.

A study was made of the release of nitrogen compounds from two Wisconsin lakes sediments that were completely mixed with the water at all times. Ekman dredge sediment samples were taken from the shallow (5 m) and deep (22 m) areas of Lake Mendota, and the deeper areas (27-32 m) of Lake Trout. Under aerobic conditions, over 49 percent of the total nitrogen present in one sample was released as soluble organic nitrogen, ammonia, and nitrate in approximately 200 days. Under anaerobic conditions, these sediments released about 6 percent of the nitrogen in a similar period of time. Sediments from the second lake released 5 and 2 percent, respectively, of the potentially released nitrogen in 100 days under aerobic and unaerobic conditions. Similar tests conducted on unstirred sediments showed that the amount of mixing was probably one of the controlling factors of nitrogen release. (Holoman-Battelle)
W73-12860

LITHIUM SILICATE SEDIMENTATION TRACER FOR SHOAL DEPOSIT STUDIES,
IIT Research Inst., Chicago, Ill.
T. K. Nedved, E. G. Fochtman, W. M. Langdon, and F. O. Sullivan.
Journal Water Pollution Control Federation, Vol 45, No 5, p 896-904, May 1973. 8 fig, 1 tab, 1 ref.

Descriptors: *Tracers, *Shoals, *Sedimentation, Suspended solids, Distribution patterns, Tracking techniques, *Path of pollutants, Sedimentation rates, Sediments, Water pollution effects, Water pollution sources, Sampling, Density, Rivers, Dispersion, *Illinois, Industrial wastes, Radioactivity techniques, On-site tests, Organic matter, Iron oxide.
Identifiers: Lithium silicate, *Calumet River (Ill.), Proton capture technique, Settleable solids, Acid insoluble material.

Investigations were conducted on a 12-mile section of the Calumet River to determine the relationships between the suspended solids discharges by outfalls and the buildup of shoals in a waterway. Shoal soundings were used to determine the long-term overall rate of shoal buildup, as well as the volume and distribution of the shoal material in a selected study area. The data indicated an average rate of shoal buildup of 0.19 ft/ month. The shoals were sampled extensively to determine the physical and chemical properties of the deposited materials. The wet density of the shoals in the area averaged 87 lb/cu ft. The ss concentration of the river in the immediate vicinity of the study outfall indicated rapid disperison of the materials discharged. These surveys further demonstrated the extreme complexities of the processes involved in shoal buildups in this particular area. Techniques were developed for quantitative tracing of the contribution of a particular discharge to the formation of shoals. Lithium metasilicate was used as the tracer material. A proton-capture technique was used to assay for the lithium. Special pan type sedimentation samplers were designed, constructed, and used in a field demonstration study. This investigation indicated that the suspended matter discharged by

the study outfall traveled considerably in both the upstream and downstream directions. Although only 30 percent of the tracer material was recovered, this study amply demonstrated that lithium metasilicate could be used successfully as a sedimentation tracer. (Little-Battelle)
W73-12862

STREAM-VELOCITY EFFECTS ON THE HEAVY-METAL CONCENTRATIONS,
Alabama Univ., University. Dept. of Biology.
L. G. Williams, J. C. Joyce, and J. T. Monk, Jr.
Journal of the American Water Works Association, Vol 65, No 4, p 275-279, April 1973. 3 fig, 2 tab, 8 ref.

Descriptors: *Heavy metals, *Suspended solids, *Toxicity, *Biological communities, Cadmium, Chromium, Copper, Mercury, Manganese, Zinc, Iron, Runoff, Scour, Sampling, Water analysis, Industrial wastes, Flow rates, Sediments, Suspension, Water pollution effects, Fish Zooplankton, Phytoplankton, Organic matter, Flocculation, Separation techniques, Path of pollutants, Bacteria, Alabama.
Identifiers: *Atomic absorption spectrophotometry, Transport, Black Warrior River, Sample preparation, Resuspension.

Water samples were collected twice weekly in two 20-liter polyethylene jugs from the Black Warrior River and three of its tributaries from February 17 to October 6, 1971. One sample was flocculated by the addition of aluminum ammonium sulfate to remove suspended matter; suspended matter from the other was concentrated by siphoning the sample through a 60 millimicron screen and settling. Samples were digested and analyzed for Cd, Cr, Cu, Hg, Mn, Zn, and Fe by atomic absorption spectrophotometry. River flow rates were also monitored. No correlation was found to exist between streamflow and the soluble concentrations of the selected heavy metals. However, a strong positive correlation did exist between the concentration of these metals and the resuspended bottom sediments, mostly in the form of ooze deposits, present in the water column following increased flow and scour from heavy rain runoff. Copper, iron, manganese, mercury, and zinc concentrations were associated with oooze sediments that accumulated during periods of low or negligible streamflow and were resuspended into the water column following scours in a complex that was destructive to favorable balance of river biota and produced slugs of water unfit for good domestic supply. Suspended particles larger than 60 millimicrons that were screened from the water samples were mostly organic and held the highest concentrations of the selected metals, whereas inorganic large particles had relatively low carrying power. (Little-Battelle)
W73-12870

THE MECHANISMS OF NITROGEN ASSIMILATION IN PSEUDOMONADS,
Newcastle-upon-Tyne Univ. (England). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W73-12881

THE UTILIZATION OF LEAF LITTER BY STREAM DETRITIVORES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 05C.
W73-12882

DISPERSION, DISPERSAL, AND PERSISTENCE OF THE ANNUAL INTERTIDAL ALGA, POSTELSIA PALMEFORMIS RUPRECHT,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W73-12883

INSECTICIDE RESIDUES IN WATER AND SEDIMENT FROM CISTERNS ON THE U.S. AND BRITISH VIRGIN ISLANDS - 1970,
Central Michigan Univ., Mount Pleasant. Dept. of Biology.
H. Lenon, L. Curry, A. Miller, and D. Patulski.
Pesticides Monitoring Journal, Vol 6, No 3, p 188-193, December 1972. 5 fig, 5 tab, 6 ref.

Descriptors: *Water analysis, *Sediments, *Cisterns, *Gas chromatography, DDT, DDD, DDE, Dieldrin, Sampling, Separation techniques, *Pesticide residues, *Insecticides.
Identifiers: *Virgin Islands, Malathion, Sample preparation, Electron capture gas chromatography.

Samples of water and sediment were collected from cisterns in four of the Virgin Islands during February and March, 1970, to be analyzed for pesticides. Water samples were collected in glass bottles, extracted by liquid-liquid partitioning with purified petroleum ether, partially evaporated, sealed in vials, and mailed to Michigan for analysis. Before analysis samples were dried with anhydrous sodium sulfate, partially evaporated and adjusted to 25 ml. Sediment samples were collected with a plankton net and mailed in screw-capped bottles. These were filtered the filter containing the sediment dried and the sediment extracted with petroleum ether. Sediment extracts were prepared the same as water extracts. All samples were analyzed for DDE, DDD, DDT, dieldrin, and malathion by electron capture gas chromatography. Evidence of an unknown malathion metabolite was found in all 49 water samples analyzed, whereas malathion was found in only two (0.01 and 0.14 ppb). DDT, its metabolites, and dieldrin were not commonly found in the water samples except those from St. John where dieldrin was detected in approximately 50 percent of the samples (average concentration-0.19 ppb). Sediment samples from cisterns, in general, contained much higher concentrations of pesticides than water, with DDT and its metabolites occurring most frequently. In many of these sediment samples, the residue levels were high enough to be of concern. As a result it is strongly recommended that cisterns be cleaned frequently to remove sediment. (Little-Battelle)
W73-12894

ANNUAL LIFE CYCLE AND PRODUCTION OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN, NOVA SCOTIA,
Bedford Inst., Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol 30, No 3, p 333-344, March 1973. 7 fig, 6 tab, 7 ref.

Descriptors: *Secondary productivity, *Zooplankton, *Life cycles, *Biomass, *Canada, Growth rates, Energy budget, Growth stages, Annual turnover, Animal growth, Water temperature, Sampling, Copepods, Least squares methods, Regression analysis, Invertebrates.
Identifiers: *Chaetognaths, Sagitta elegans, *Bedford Basin (N.S.), Eggs, Food sources, Correlation coefficients, St. Margaret's Bay.

A study has been made on the population of Sagitta elegans in Bedford Basin for which comparable data on the basic production system are available (Sameoto, 1971). Horizontal and oblique samples of zooplankton were taken after dark at five stations inside and two stations outside the Basin. The samples were analyzed within a week of collection. S. elegans over 5 mm long were removed, counted, and weighed after blotting on filter paper. The remaining sample was split and the stages of S. elegans less than 5 mm were counted. Free water was removed from the sample of copepods obtained upon sorting and the sample weighed to obtain a biomass estimate. The method used to stage the animals and analyze the different modes of the S. elegans population was that used by Sameoto (1971). In Bedford Basin, Nova Scotia, Sagitta elegans has two main generations per year, one in the spring and one in the fall. The biomass of S. elegans per 100 cu m of water was an order of magnitude greater in the Basin than that reported previously for St. Margaret's Bay, N.S. The growth rate and the number of degree days needed to mature were similar to those found for S. elegans in St. Margaret's Bay. Annual turnover rate for S. elegans in the Basin was 5.6 and yearly production was estimated at 27.0 kcal per year or 9.0 percent of the yearly copepod production. It was calculated that the species used 90.4 kcal per sq m per year in respiration. The percentage of the total yearly production of copepods consumed by S. elegans was estimated at 36 percent. (Holoman-Battelle)
W73-12898

A RELATIONSHIP BETWEEN HETEROTROPHIC UTILIZATION OF ORGANIC ACIDS AND BACTERIAL POPULATIONS IN WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W73-12903

THE CHARACTERIZATION OF SOLUBLE PHOSPHORUS RELEASED BY LIMNETIC ZOOPLANKTON,
Toronto Univ. (Ontario). Dept. of Zoology.
R. Peters, and D. Lean.
Limnology and Oceanography, Vol 18, No 2, p 270-279, March 1973. 6 fig, 3 tab.17 ref.

Descriptors: *Phosphorus, *Zooplankton, *Pollutant identification, *Radiochemical analysis, Phosphates, Waterfleas, Copepods, Radioactivity techniques, Cycling nutrients, Phosphorus radioisotopes, Anion exchange, Seston, Absorption, Solubility.
Identifiers: Characterization, Orthophosphates, Nutrient availability, Diaptomus minutus, Daphnia rosea, P-32, Gel filtration chromatography, Molybdates, Phosphorus cycle.

Three rapid techniques were used to characterize the main forms of soluble phosphate released by Daphnia rosea. Uniformly P-32-labeled laboratory animals were transferred to nonradioactive water and most of the soluble radiophosphorus was shown to be similar to PO4 in anion exchange, in gel filtration chromatography, and in a kinetic analysis of incorporation by natural seston. In addition, Diaptomus minutus was labeled in situ with P-32 and its release products compared to PO4 by gel filtration. This analysis and those using Daphnia indicated that the released soluble phosphorus was about 90 percent orthophosphate. However, molybdate analyses of the soluble phosphates released in a 10-hr experiment showed them to be only 60 percent orthophosphate. Net reuptake of orthophosphate was insufficient to account for this discrepancy. Recycling of phosphorus is postualted in longer experiments, which leads to a substantial underestimate of the orthophosphate release. (Holoman-Battelle)
W73-12904

ANNUAL PRODUCTION OF A STREAM MAYFLY POPULATION: A COMPARISON OF METHODS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
T. F. Waters, and G. W. Crawford.
Limnology and Oceanography, Vol 18, No 2, p 286-296, March 1973. 6 fig, 5 tab, 31 ref.

Descriptors: *Mayflies, *Standing crops, *Secondary productivity, *Animal growth, *Methodology, Growth rates, Bottom sampling, Aquatic in-

sects, Annual, Life history studies, Annual turnover, *Minnesota.
Identifiers: *Comparative studies, Removal summation method, Instantaneous growth method, Allen curve method, Hynes method, Method evaluation, Data interpretation, Ephemerella subvaria.

The annual production of the mayfly Ephemerella subvaria McDunnough in a small central Minnesota stream, Luxembury Creek, was estimated by four methods: a removal-summation method, the instantaneous growth method, the Allen curve, and the Hynes method. Basic data on standing crop and growth rates were obtained from a series of bottom samples covering the life cycle of the mayfly. The life history of E. subvaria was clear and simple, and the data were particularly amenable to production estimation by all four methods. The first three yielded estimates of annual production that generally agreed, ranging from 26.4 to 28.9 g/sq m. The Hynes method yielded an estimate 15.2 to 26.1 percent higher, or 33.3 g/sq m. Cohort turnover ratios for the first three methods ranged from 4.2 to 4.6 (not calcuable for the Hynes method); the annual turnover ratio for the first three methods ranged from 5.8 to 6.3 and was 7.2 for the Hynes method. (Mortland-Battelle)
W73-12905

BACTERIAL CONTENT OF PARTICULATE MATTER IN OFFSHORE SURFACE WATERS,
Woods Hole Oceanographic Institution, Mass.
H. W. Jannasch.
Limnology and Oceanography, Vol 18, No 2, p 340-342, March 1973. 1 tab, 7 ref.

Descriptors: *Sea water, *Organic matter, *Marine bacteria, Surface waters, Carbon, Cultures, Filtration, Water sampling, Methodology.
Identifiers: *Sargasso Sea, *Particulate matter, Heterotrophic bacteria, Culturing techniques, Sample preparation.

During a cruise in the Sargasso Sea, flakelike particles swirling up with the surface waves motion were encountered. These particles showed intense iridescence and it required more than an hour at a speed of 11-12 knots to sail out of them. Because the particles would disintegrate with only slight disturbance of the water, they were very difficult to sample. Methods were devised to obtain small samples of small size particles. Subsamples were shaken vigorously, streaked on agar plates, membrane filtered, and incubated on the same agar medium at 22 plus or minus 1 C for 4 days. The data taken from these cultures indicated the absence of attached bacteria and made it appear unlikely that the particulate material was inhibitory to bacterial growth or attachment. This was interpreted as an indication that the particles were of relatively recent origin and in a labile state. (Mortland-Battelle)
W73-12912

A MATHEMATICAL MODEL OF THE NUTRIENT DYNAMICS OF PHYTOPLANKTON IN A NITRATE-LIMITED ENVIRONMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05C.
W73-12915

SIMULATION STUDY OF PHYTOPLANKTON PHOTOSYNTHESIS AND GROWTH IN THE FRASER RIVER ESTUARY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-12919

MERCURY DISTRIBUTION IN ESTUARINE--NEARSHORE ENVIRONMENT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom.
Journal of the Waterways Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 99, No WW2, p 257-265, May 1973. 5 fig, 2 tab, 6 ref.

Descriptors: *Estuarine environment, *Mercury, *Path of pollutants, Estuaries, Rivers, Bottom sediments, Plant tissues, Plankton, Water pollution, Salt marshes, Heavy metals, Coastal marshes, Marsh plants, Distribution, Pollutants, Water sampling, Bottom sampling, Absorption, Chemical analysis, Salinity, Water analysis, Suspended sediments, Sedimentation, Rhizomes, Root systems, Leaves.
Identifiers: *Nearshore waters, Spartina alterniflora, Reduction aeration flameless atomic absorption, Flameless atomic absorption spectrophotometry, Marsh grass.

Samples of estuarine and nearshore waters were collected in the area of the southeastern United States between Cape Romani, South Carolina and Jacksonville, Florida for mercury analysis by the reduction aeration flameless atomic absorption technique. Samples of Spartina alterniflora were taken from 2 areas of different salinity; sediment cores were also taken from those areas and from adjacent channels for comparison. Plankton samples were from surface waters nearshore and offshore of the northeast and southeast U.S. coast. All mercury samples were analyzed as the water samples. It was found that the transfer of mercury through an estuarine system of the Southeastern Atlantic Coast to the open ocean is controlled by: (1) mixing of estuarine waters with offshore waters; (2) loss in plant detritus due to rafting offshore; (3) migration of estuarine organisms to offshore areas. An additional loss of mercury from the estuarine system is due to sedimentation. A budget of mercury for estuaries along the Georgia Coast indicates that the dominant salt marsh plant, Spartina alterniflora, exerts a strong control on the migration of this metal. Mercury enters the estuary primarily in solution, delivering approximately 1.5 mg annually to each square meter of salt marsh. The annual uptake of mercury by the plant is approximately 0.7 mb/sq m of salt marsh. (Holoman-Battelle)
W73-12920

POLIOVIRUS IN A WATER SUPPLY,
Michigan Dpt. of Public Health, Lansing. Bureau of Environmental Health.
T. L. Vander Velde, and T. C. Broyer.
Journal of the American Water Works Association, Vol 65, No 5, p 345-348, May 1973. 4 tab, 2 fig.

Descriptors: *Isolation, Water pollution sources, *Water supply, *Drainage wells, Waste water (Pollution), *Potable water, *Sewerage, Methodology, Environmental effects, E. coli, Bioindicators, Pollutant identification, *Viruses, Coliforms, Chlorination, Chlorine, Water sampling, Electron microscopy, Centrifugation, *Michigan.
Identifiers: *Poliovirus, Culture media, Red Cedar River, Selective media, Sample preparation.

This is a two-part paper concerning the isolation of poliovirus from well water in Monroe County, Michigan. The first article considers construction of the well, geological features of the area, and the operation from which water samples were taken. The second article discusses laboratory and research techniques involved in the isolation of the poliovirus. A 5-gallon sample was taken from the well and divided into two equal volume. Fifty ml of water were removed from each sample and 10 ml were used to seed five tubes of lauryl sulfate double-strength broth to detect coliforms. Two samples were concentrated on the ultracentrifuge and tested for virus on green, African-monkey kidney-cell cultures. A virus was isolated and identified as poliovirus 2. E. coli was recovered from the concentrated samples. The tests indicated that viruses are viable and can survive where bacteria do not. In this case, there was little evidence of contamination and it required a great deal of concentration of the samples before the coli organisms and the virus were detected. (Mortland-Battelle)
W73-12922

INVESTIGATION OF THE ENVIRONMENTAL FACTORS WHICH AFFECT THE ANAEROBIC DECOMPOSITION OF FIBROUS SLUDGE BEDS ON STREAM BOTTOMS,
Lawrence Univ., Appleton, Wis.
A. M. Springer.
Available from--Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No. 73-7,166. Ph D Dissertation, 1972. 178 p.

Descriptors: *Distribution, *Biodegradation, *Pulp wastes, Fibers (Plant), Cellulose, Mathematical models, Energy budget, Pulp and paper industry, Sludge, Sludge digestion, Water temperature, *Wisconsin.
Identifiers: *Fox River (Wis), Glucose, Cellobiose.

Redistribution and decomposition of fibrous sludge from paper mills have been studied in the lower Fox River between Lake Winnebago and Green Bay, Wisconsin. In June 1970 approximately 50 percent of the river bottom was covered with fibrous sludge to a depth which ranged from six inches to several feet. A mathematical model was developed to predict sludge distribution, and it appeared to depict actual river conditions quite well. Approximately 4/5 of the lower Fox River is subject to sludge deposition, scour, and redistribution; while the remaining 1/5 is either always free of sludge or contains permanent beds. The principal mechanism for sludge bed destruction is decomposition, since scour and flotation merely relocate the sludge at another position in the river. A linear temperature profile is found in the bed, indicating that the energy generated by the decomposition process is negligible in comparison to that conducted in from outside the bed. Laboratory studies demonstrated that anaerobic decomposition is the principal mechanism for the destruction of organic matter in a sludge bed. Chemical pulps anaerobically decompose faster than do groundwood pulps of similar surface-to-volume ratios by a factor of about two. The rate-limiting step in the anaerobic decomposition process is the breakdown of cellulose into glucose and/or cellobiose. Temperature has an appreciable effect on the rate of fibrous sludge anaerobic decomposition. Appreciable differences in rate of decomposition occur at different river locations and at different times of the year in the same location. The life of a fibrous sludge bed in the lower Fox River would be one to two years if no new material were added to the bed. (Little-Battelle)
W73-12936

TRACE ELEMENT TRAPPING IN PTEROPOD TESTS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
K. K. Turekian, A. Katz, and L. Chan.
Limnology and Oceanography, Vol 18, No 2, p 240-249, March 1973. 3 fig, 3 tab, 15 ref.

Descriptors: *Trace elements, *Absorption, *Plankton, *Transport depletion, Gastropods, Sea water, Heavy metals, Path of pollutants, Neutron activation analysis, Chemical analysis, Atlantic Ocean, Mollusks, Invertebrates, Iron, Chromium, Cobalt, Kinetics, Methodology.
Identifiers: *Instrumental neutron activation analysis, *Pteropods, *Shells, Rare earth elements, Fate of pollutants, Detection limits, Sample preparation, Lanthanum, Samarium, Europium, Thorium, Scandium, Antimony, Selenium, Particulate matter, *Gulf of Aqaba, Cerium, Long Island Sound, Cavolinia quadridentata, Clio pyramidata, Cavolinia unicata, Creseis acicula, Styliola tubula, Limacina retroversa.

Pteropod tests from the Gulf of Aqaba and the South Atlantic Ocean and 'bulk' (soft tissue) plankton samples from Long Island Sound were analyzed by instrumental neutron activation analysis (INAA) for 11 trace metals (Fe, Ce, La, Sm, Eu, Th, Sc, Cr, Co, Sb, Se) to study the trapping and transport mechanisms for these metals in the oceans and the capability of pteropods to modify the composition of seawater during this process. The internal correlations among these metals strongly suggest that a finely particulate (less than 0.2 micron) authigenic iron-rich phase (hydrated oxide or phosphate) is trapped by both the soft and hard tissues of plankton and that this phase is the major carrier of several of the trace metals. Assuming that the iron-rich floc-trapping mechanism is applicable to all pelagic calcareous tests, then the downward flux of iron and associated trace elements carried by these tests can be assessed. This assumption leads to the conclusion that the iron and the associated trace elements have residence times in the deep water of the same order of magnitude as that of the deep water itself. (Holoman-Battelle)
W73-12937

BACTERIAL DEGRADATION OF DETERGENT COMPOUNDS,
Missouri Univ., Columbia. Div. of Biological Sciences.
R. A. Goodnow, and A. P. Harrison, Jr.
Applied Microbiology, Vol 24, No 4, p 555-560, October 1972. 3 tab, 6 ref.

Descriptors: *Surfactants, *Microbial degradation, *Detergents, Biodegradation, Aerobic bacteria, Assay, Linear alkylate sulfonates, Water pollution, E. coli, Pollutants, Pathogenic bacteria, Coliforms.
Identifiers: *Bacterial physiology, *Fate of pollutants, Tallow alkyl sulfate, Alkyl ethoxylate sulfate, Culture media, Substrate utilization.

A survey for surfactant degradation among aerobic bacteria has been undertaken. Tests have been made in peptone medium where such a degradation, if it occurs, will be gratuitous. Tallow-alkyl-sulfate, alkyl-ethoxylate-sulfate, and linear-alkyl-benzene-sulfonate were used. Forty-five strains of 34 species in 19 genera degrade one or more of these detergent compounds. With some species, the surfactant inhibits degradation without inhibiting growth, whereas with one species slight degradation took place even at a toxic concentration of surfactant. (Holoman-Battelle)
W73-12938

SALT POLLUTION OF A SHALLOW AQUIFER--INDIANAPOLIS, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Geography and Geology.
H. W. Dennis.
Ground Water, Vol 11, No 4, p 18-22, July-August 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Water pollution sources, *Groundwater movement, *Path of pollutants, *Salts, Saline water, Sodium chloride, Deicers, Salinity, Indiana.
Identifiers: *Indianapolis.

Runoff from large quantities of deicing salts can contaminate groundwater. Tests of water samples from shallow wells in 1967, 1968, and 1973 document the loss of a water supply in an Indianapolis, Indiana, suburban housing development. In 1966 a salt company taking advantage of the location relative to the transportation net of the region, established a distribution point for highway deicing salts at Stout Field in Indianapolis, Indiana. The salts, only partially protected from the elements, were stored on the southwest end of the abandoned southwest-northeast runway. Runoff from any freshet or storm carried salt to the south and contaminated a shallow aquifer. Investigations by State and city health officials led to removal of the salt. With the salt removed, the same processes which led to the problem aided in flushing and dilution of the high chloride water. In a little over a year's time, dilution by rapid recharge of storm water into the shallow aquifer had reduced the chloride content of the water to a palatable level. Five years after the salt was removed, the chloride level is approaching acceptable limits. (Knapp-USGS)
W73-12940

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, OCTOBER, 1972,
Geological Survey, Lakewood, Colo.
L. J. Schroder, and W. C. Ballance.
Available from NTIS, Springfield, Va 22151 as USGS-474-169, Price $4.00 printed copy; $1.45 microfiche. Report USGS-474-169 (Amchitka-40), May 1973. 15 p, 3 fig, 2 tab, 5 ref. AEC Contract AT (29-2)-474.

Descriptors: *Nuclear explosions, *Radiochemical analysis, *Alaska, *Water pollution sources, Tritium, Water analysis, Correlation analysis, Water quality.
Identifiers: *Amchitka Island (Alaska), Gross alpha activity, Gross beta activity.

Water samples were collected from Amchitka Island, Alaska, during October 1972. Tritium determinations were made on all samples collected and gross alpha and gross beta/gamma determinations were made on 41 samples. The gross alpha and gross beta determinations when compared with previously determined ranges for freshwaters on Amchitka Island show no trends. The gross alpha activity, as U equivalent, ranged from less than 0.3 to 1.7 pCi/liter (picocuries per liter) for the October 1972 sampling; one value was less than 2.7 pCi/liter. This compares with a range from less than 0.1 to 23 pCi/liter in freshwaters on Amchitka observed prior to detonation of Cannikin as reported by Beetem, Washington, Janzer, and Schroder (1971). The gross beta activity in water as Cs-137 equivalent in the October 1972 samples ranged from 1.7 to 14 pCi/liter. This range, compared to the range observed in freshwater samples obtained prior to Cannikin (less than 1.0 to 36 pCi/liter), shows no indication of event-related radioactivity. The only water samples having detectable (greater than 640 pCi/liter) tritium activity were those collected at the Long Shot site. The sample from ST01-52, Weir 1, which represents surface water drainage of the Long Shot site, had a tritium concentration of 790 pCi/liter. (Woodard-USGS)
W73-12945

INVESTIGATION OF THE NATURE, EXTENT AND FATE OF NATURAL OIL SEEPAGE OFF SOUTHERN CALIFORNIA,
California Univ., Santa Barbara.
P. G. Mikolaj, A. A. Allen, and R. S. Schlueter.
Available from NTIS, Springfield, Va. 22151 as COM-73-10447 - Price $3.00 printed copy; $1.45 microfiche. Preprint of Paper OTC 1549, presented at 4th Annual Offshore Technology Conference, Houston, Texas, May 1-3, 1972. 16 p, 6 fig, 1 tab, 19 ref. NSF Grants GH-43 and GH-95, NOAA SG USDC 2-35208-5.

Descriptors: *Water pollution sources, *Oil, *Coasts, *Bays, *California, Seepage, Geomorphology, Surveys, Oily water, Data collections, Evaluation.
Identifiers: *Natural oil seepage, Oil slicks.

Natural oil and gas seeps in the Santa Barbara Channel and in Santa Monica Bay have been investigated using aerial, surface, and underwater survey techniques. These studies have provided an insight to the nature and extent of natural submarine seepage and have resulted in the development of procedures and equipment for investigating oily material in the marine environment. Ten separate zones of offshore seepage have been investigated and extensive bottom surveys at some of these sites have revealed ocean floor conditions, modes of oil release, and seepage flow rates. Oil is released from these seeps at a total rate approaching 100 barrels per day, and the resulting oil slicks contaminate several square miles of surface water. Standardized methods have been developed for sampling, classifying, and characterizing oil-tar beach pollutants; these techniques have been field tested and have provided baseline pollution levels along several miles of coastline. (Woodard-USGS)
W73-12958

TRACE METAL BASELINE STUDIES ON THE MURDERKILL AND ST JONES RIVERS, DELAWARE COASTAL PLAIN,
Delaware Univ., Newark. Dept. of Geology.
F. Bopp, III, F. K. Lepple, and R. B. Biggs.
Available from NTIS, Springfield, Va. 22151 as COM-73-10580 - Price $3.00 printed copy; $1.45 microfiche. Delaware University College of Marine Studies Report DEL-SG-10-72, December 1972. 31 p, 11 fig, 3 tab, 5 ref.

Descriptors: *Baseline studies, *Water quality, *Trace elements, *Rivers, *Delaware, Construction, Sewage treatment, *Bottom sediments, Chemical analysis, Iron, Magnesium, Zinc, Chromium, Copper, Lead, Cadmium, Mercury, Nickel, Strontium, Correlation analysis, Water pollution sources.
Identifiers: *Murderkill River (Del), *St. Jones River (Del).

Concentrations of trace metals are tabulated for bottom sediment samples collected from the Murderkill and St. Jones Rivers in Delaware. The principal purpose is to establish a trace metal baseline for the Murderkill River prior to commencement of operation of the Kent County Regional Sewage Treatment Plant, presently under construction near Frederica, Delaware. Baselines will be established for iron, magnesium, zinc, chromium, copper, lead, cadmium, mercury, nickel and strontium. In addition to the establishment of these baselines, the second purpose is to contrast the Murderkill River baseline with a similarly established baseline for the St. Jones River, which has been the recipient of domestic sewage and industrial and other wastes for a number of years. By comparing the results of these two river systems' baselines, it is hoped that some projection may be made of those metals which should be reasonably closely monitored after commencement of operation of the sewage treatment facility. (Woodard-USGS)
W73-12959

A SYMPOSIUM ON THE PRESERVATION AND MULTIPLE-USE PROBLEMS IN THE GREAT LAKES,
Department of Fisheries and Forestry, Ottawa (Ontario).
For primary bibliographic entry see Field 05C.
W73-12962

EFFECT OF ENVIRONMENTAL FACTORS ON WATER UTILIZATION AND BORON ACCUMULATION AND TRANSLOCATION IN SUGARCANE,
Hawaii Agricultural Experiment Station, Honolulu.
For primary bibliographic entry see Field 03F.
W73-12966

NITROGEN LOSS FROM FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-12967

MERCURY IN CANADIAN FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05C.
W73-12970

EFFECT OF TIME, WATER FLOW AND PH ON CENTRIPETAL PASSAGE OF RADIOPHOSPHORUS ACROSS ROOTS OF INTACT PLANTS,
Connecticut Univ., Storrs. Dept. of Plant Science.
F. H. Emmert.
Plant Physiol. Vol 50, No 3, p 332-335, 1972. Illus.
Identifiers: *Bean roots, Centripetal passage, Humidity, Phaseolus-vulgaris, Phosphorus, Hydrogen ion concentration, *Radiophosphorus.

The effects of time, rate of the water flow and ambient pH on centripetal passage of radiophosphorus across intact bean (Phaseolus vulgaris) roots to the xylem were studied. Isotope which completed passage and entered the xylem stream, as well as amounts delivered to the plant top, served to measure centripetal passage. Centripetal passage of radiophosphorus increased parabolically reaching a maximum after 1 hr and maintained this level during the second hr. This pattern was consistent for all conditions studied. The curve suggested that passage did not progress as an abrupt front, but rather that it occurred through a phosphorus pool before reaching the xylem. Differences in rate of water flow through test plants, accomplished by adjusting the humidity of the foliage environment, did not significantly affect centripetal passage of radiophosphorus. Water flow did, however, profoundly influence composition of the xylem stream by altering the solvent to isotope ratio. Centripetal passage of radiophosphorus was not affected by solution pH in the acid range (pH 4.8, 5.2, 6.4), but was inhibited in the more alkaline range (pH 7.0, 7.5, 8.0). The similarity of these findings to those in the literature for phosphorus uptake by individual cells suggests that cell uptake may constitute the primary rate-limiting step in the over-all process of ion passage to the xylem.--Copyright 1973, Biological Abstracts, Inc.
W73-12991

ON THE WATER POLLUTION IN THE AREA OF URBAN DEVELOPMENT (IN JAPANESE),
Kobe Univ. (Japan). Faculty of Agriculture.
S. Coto, and N. Hatazawa.
Sci Rep Fac Agric Kobe Univ. Vol 10, No 1, p 97-101, 1971. Illus. English summary.
Identifiers: Bacteria, Fish, Pollution, *Urban development, *Water pollution, *Japan, Chlorides, Sulfides.

The amount of Cl' increases in accordance with the increase of the population density. Cl' contents of 3 rivers near Akashi City are practically equal, and also the concentration of Cl' has a tendency to be in proportion to that of SO4'. Biological O2 demand is high in the water of the Hazetani, lower in the Akashi, and highest in the Igawa. The pollution of the Hazetani has its origin in the waste from the livestock industry and that of the Igawa is caused by waste from factories. The numerical value of bacterium/ml in the water of the Igawa is the highest and is the least in the Akashi. While farmers use wells for the most part, it was found that the majority of well water is not fit to drink. The Osaka Group has several marine clay layers and in case of Shempoku New Town these layers were exposed to the air by the earthwork. The runoff water over the surface was contaminated with the marine clay (pH 2.71) and fishes in the reservoir died from the inflow water. The amount of SO4' was 110 ppm and the pH of the water was 4.2.--Copyright 1973, Biological Abstracts, Inc.
W73-12996

INFLUENCE OF WATER POTENTIAL ON GROWTH, ANTIBIOTIC PRODUCTION AND SURVIVAL OF CEPHALOSPORIUM GRAMINEUM,
Washington State Univ., Pullman. Dept. of Plant Pathology.
G. W. Bruehl, B. Cunfer, and M. Tioviainen.
Can J Plant Sci. Vol 52, No 4, p 417-423, 1972. Illus.
Identifiers: Antibiotic production, *Cephalosporium-gramineum, Growth, Survival, Wheat straw, *Fungus.

C. gramineum grew on agar media at osmotic water potentials from -1.3 bars to between -98 and -112 bars. The growth of antibiotic -producing (+) and nonproducing (-) isolates was affected equally by water potential. Antibiotic production was detected by bioassay over the entire range of significant growth (to about -83 to -98 bars). Production of antibiotic relative to the growth rate of C. gramineum was least when the fungus grew fastest and most when the fungus was under moderate water stress (between -27 and -55 bars). When (wheat) straws infested with C. gramineum were incubated on soil at 15C at various water potentials, + isolates had the least advantage over - isolates on water saturated soil (near 0 bar) and at the driest condition tested (-258 bars). In contrast, antibiotic-producing isolates had the greatest survival advantage between -10 and -67 bars, which corresponds to the range of water potentials within which antibiotic production was greatest relative to mycelial growth. The vigor of C. gramineum in straw on water-saturated soil indicates coexistence with bacteria; its performance between about -10 and -137 bars indicates that relatively xerophytic soil fungi are its most severe antagonists in nature.--Copyright 1973, Biological Abstracts, Inc.
W73-12999

5C. Effects of Pollution

ASPECTS OF THE BIOGEOCHEMISTRY OF CARBOHYDRATES AND PROTEINS IN AQUATIC ENVIRONMENTS,
Woods Hole Oceanographic Institution, Mass.
K. Mopper, and E. T. Degens.
Available from the National Technical Information Service as PB-212 685, $3.00 in paper copy, $1.45 in microfiche. Technical Report WHOI-72-68, September 1972. 249 p, 34 fig, 6 tab, 107 ref, 4 append.

Descriptors: *Geochemistry, *Biochemistry, *Carbohydrates, *Proteins, *Cycling nutrients, *Sediments, *Organic matter, Bottom sediments, Aquatic environments, Diagenesis, Degradation (Decomposition), Metals, Ions, Organic compounds, Paleolimnology, Amino acids, Organic wastes, Analysis, Diatoms, Coral, Plankton, Carbon, Nitrogen, Technology, Chromatography, Climatic zones, Analytical techniques, Sedimentology, Oceans.
Identifiers: Red Sea, Black Sea, Lake Tanganyika (Africa), Lake Kivu (Africa), Arabian Sea, Gay Head (Bermuda), Cariaco Trench (Venezuela), Walvis Bay (S. Afr.), Argentine Basin, Oyster Pond (Woods Hole, Mass.), Winthrop (Mass.), Cranston (Rhode Island), Foraminifera, Vertebrates, Iceland, New York Bight, Mineralized tissues, Sugar analysis.

Factors affecting organic matter cycling, factors determining quantity and quality of organic matter incorporated into sediment, effect on composition and structure of organic input at sediment-water interface, diagenetic factors affecting sediment organic matter, organic matter condition during diagenesis, and possible fossil organic matter use to elucidate paleo-environments are considered. In shallow regions of the ocean, input is predominated by tripton; in deep regions input is predominated by aged, refractory material with composition reflecting a composite of highly degraded tripton and particulate organic matter formed from dissolved organic matter. Biological degradation is limited to the upper 10-20 cm of sediment. At 20 cm below the sediment-water interface further diagenesis occurs more slowly and is controlled by processes such as organic-organic condensation, organic-metal ion complexation, organic-mineral interaction, and increasing temperature. The degree of metal complexation or carbohydrates is indicative of the Eh at the sediment-water interface. Amino acids become increasingly metal-complexed with time, hence, the degree of complexation of amino acids may not be as useful as that of sugars for determining paleo-acidizing and paleo-reducing conditions. Glucose content of sediment may give estimates of terrigenous input. A high amino acid to hexosamine ratio reflects high productivity, perhaps eutrophication. (Jones-Wisconsin)
W73-12371

ENERGETICS OF NATURAL POPULATIONS OF FRESHWATER MACROCONSUMERS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Available from the National Technical Information Service as TD-COO-2002-20, $3.00 in paper copy, $1.45 in microfiche. Progress Report 1971-1972. 52 p, 8 fig, 11 ref, append. AEC AT (11-1)2002.

Descriptors: *Degradation (Decomposition), *Aquatic populations, *Energy budget, *Detritus, Model studies, Streams, Leaves, Periphyton, *Michigan, Respiration, Predation, Grazing, Data collections, Digestion, Microorganisms, Data storage and retrieval, Data processing, Growth rate, Metabolism, Herbivores, Computer programs, Foods, Analytical techniques.
Identifiers: *Detrivores, *Macroconsumers, Leaf litter.

Energy budgets for key component macroconsumer species were delineated within the framework of a generalized model of stream ecosystem function. Emphasis was on natural field populations and the interrelation of data at the population level to the overall structure and function of woodland stream ecosystems. Species associated with leaf litter processing were studied: large species ('shredders') involved in fragmentation of microbially infested litter, and smaller species ('collectors') feeding on resultant fine detrital particles. Given existing data of temperate zone streams, the general pattern in undisturbed systems is a dependence upon the input of reduced carbon compounds of terrestrial origin and, therefore, the dominance of heterotrophic processing. Besides a general statement covering the overall aspects of leaf litter, predictions will be possible concerning relative roles of microbial populations, shredders and collectors, in the processing of large particle detritus. Consumption indices for representative species in relation to age, density, food quality and quantity, temperature and species interactions were determined. Tracer studies were employed for additional independent estimates of consumption index values in the case of shredders and for collectors and grazers when it is difficult to make gravimetric assessments of food supply. (Jones-Wisconsin)
W73-12374

PREIMPOUNDMENT STUDY OF WEST POINT LAKE, GEORGIA,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
R. F. Schneider, D. W. Hill, M. R. Weldon, and R. E. Gentry.
Available from the National Technical Service as PB-213 306, $3.00 in paper copy, $1.45 in microfiche. Technical Study TS 03-71-208-001.2, January 1972. 201 p, 30 fig, 12 tab, 21 ref, 10 append.

Descriptors: *Pre-impoundment, *Georgia, *Reservoirs, Physical properties, Chemical analysis, Biological properties, Bacteria, Benthos, Temperature, Color, Turbidity, Hydrogen ion concentration, Conductivity, Suspended solids, Dissolved solids, Dissolved oxygen, Biochemical oxygen demand, Alkalinity, Chlorides, Nitrogen, Phosphorus, Organic matter, Iron, Manganese, Phytoplankton, Periphyton, Invertebrates, Coliforms, Salmonella.
Identifiers: *West Point Lake (Ga.), Chattahoochee River (Ga.).

The proposed West Point Lake, Georgia, is designed to provide hydroelectric power, flood control, navigation, water supply and recreation. The potential for accelerated eutrophication and its associated nuisance problems are increased greatly by both past and current municipal and industrial development in the watershed. Thermal stratification is expected to occur following impoundment. Associated hypolimnetic problems of low dissolved oxygen, sulfide odors, and high levels of dissolved iron and manganese may also occur unless corrective measures are taken. Isolated Salmonella serotypes indicate several areas would be hazardous for recreation at present. Fecal coliform densities violate recreational water quality criteria at many stations. After closure of the dam, the increased residence time in the lake will tend to dampen water quality variations now present in the free-flowing streams and partially reduce bacterial densities and water turbidity from preimpoundment levels to levels acceptable for a variety of water uses. Following completion of secondary biological treatment and chlorination at a wastewater treatment plant, water quality should improve. Secondary treatment and disinfection by that time will also be provided by most other wastewater treatment plants involved. Combined sewer discharges during rains will probably cause problems for many years. (Jones-Wisconsin)
W73-12376

NUTRIENT ENRICHMENT AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske.
Available from the National Technical Information Service as COO-2003-17, $3.00 in paper copy, $1.45 in microfiche. Progress Report, July 1972. 25 p, 2 fig, 1 tab, 27 ref. AEC At (11-1)-2003.

Descriptors: *Eutrophication, *Lake Michigan, *Nitrogen, *Phosphorus, *Silica, Great Lakes, Phytoplankton, Productivity, Carbon, Ammonia, Chemical analysis, Cyanophyta, Diatoms, Model studies, Nutrients, Analytical techniques, Limiting factors, On-site tests, Laboratory tests, Water pollution effects, Trace metals, Vitamins.

A program has developed and focuses on phytoplankton, phytoplankton productivity, major plant nutrients, the distribution and interrelationship of these parameters, and causative mechanisms associated with accelerated eutrophication of the upper Great Lakes, particularly Lake Michigan. A general model that can be used to predict and assess the state and rate of eutrophication in the three upper Great Lakes was formulated. Of the major plant nutrients, phosphorus is the limiting nutrient; thus phosphorus inputs and supplied control eutrophication rate. In large lakes, such as the Great Lakes, which have long renewal times, net utilization of silica and nitrogen is an excellent means of assessing the extent and rate of eutrophication. Silica utilization is a good measure of the eutrophication rate in these lakes because phytoplankton assemblages are composed mainly of diatoms. Another valid measure is net nitrate nitrogen utilization until nitrogen is depleted or until significant nitrogen fixation occurs. Both limiting conditions seem to occur more or less simultaneously. Since phosphorus is the major limiting nutrient, rate of eutrophication should be predictable from concentrations of paticulate or total phosphorus. (Jones-Wisconsin)
W73-12377

GAS PRODUCTION IN SEDIMENTS OF LAKE MENDOTA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. L. Chen, D. R. Keeney, J. G. Konrad, A. J. Holding, and D. A. Graetz.
J Environ Qual. Vol 1, No 2, p 155-158. 1972.
Identifiers: *Gas production, Sediments, Wisconsin (Lake Mendota), *Lake sediments, Lakes.

Nitrate added to Lake Mendota sediment samples incubated under anoxic conditions disappeared rapidly. When 15NO3 was added, 15N2 appeared in the atmosphere within 24 hr. Gas collected from sediments in situ contained from 24 to 50% N2 and from 45 to 75% CH4. Sediment samples from 3 sites in the lake varying in depth of water column were incubated under He in the laboratory. Production of N2 and CH4 increased with time at a low (2 ppm) level of NO3-N addition, but CH4 production was inhibited for at least 27 days by addition of 100 to 1000 ppm NO3-N. Production of N2 was less at 1000 than at 500 ppm NO3-N added, probably due to suppression of the nitric oxide reductase enzyme system. Evidence was obtained that the denitrification pathway in lake sediments is the same as that reported for submerged soils.--Copyright 1972, Biological Abstracts, Inc.
W73-12378

THE INFLUENCE OF VEGETATION ON THE REDOX PROFILE IN THE SEDIMENT OF GRANE LANGSO, A DANISH LOBELIA LAKE,
Copenhagen Univ., Hillerod (Denmark). Freshwater-Biological Lab.
S. Wium-Andersen, and J. M. Andersen.
Limnology and Oceanography, Vol 17, No 6, p 948-952, 1972. 3 fig, 1 tab, 11 ref.

Descriptors: *Vegetation, *Oxidation-reduction potential, *Sediments, Lakes, Rooted aquatic plants, Oxygen, Photosynthesis, Iron compounds, Sands, Mud, Rhizosphere.
Identifiers: *Grane Langso (Denmark), *Lobelia, Littorella, Isoetes, Kalgaard So (Denmark), Isoetides, *Denmark.

The sediment redox profiles in Danish lakes supporting rooted plants is substantially changed by the vegetation. To a water depth of 4 m, sediment in Grane Langso consists of sand, and, at greater depths, of mud. Rooted vegetation occurs to a depth of 4-5 m, the most important plants being the isoetides: Littorella uniflora, Lobelia dortmanna, and Isoetes lacustris. The redox potentials and the pH were measured on two cores from each depth. Measurements of Eh in the sediment have shown the upper 20 cm of sediment is oxidized down to a 4 m depth. The constant Eh values can be explained by relative constant biomass of the isoetides throughout the year. In the laboratory Lobelia was manipulated to photosynthesize in the aquarium under simulated natural conditions. Oxygen liberation was 3-5 times greater by the roots than by the leaves, agreeing with the fact that root surface of Lobelia is 3-5 times larger than the leaf surface. It is concluded that the plants work as oxygen pumps. Presence of an oxidized rhizosphere depends on the presence of isoetides. If eutrophication causes their disappearance, the oxidized rhizosphere also disappears. (See also W73-12378) (Jones-Wisconsin)
W73-12379

FISH VIRUSES: HISTOPATHOLOGIC CHANGES ASSOCIATED WITH EXPERIMENTAL CHANNEL CATFISH VIRUS DISEASE,
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
K. Wolf, R. L. Herman, and C. P. Carlson.
J Fish Res Board Can. Vol 29, No 2, p 149-150. 1972. Illus.
Identifiers: *Channel catfish, *Fish diseases, Histopathologic change (Fish), Viruses, *Catfish virus.

A histologic examination was carried out on fry with experimentally induced channel catfish virus disease (CCVD). The infection produced a hemorrhagic and necrotic disease with the target organs being the kidneys, liver, digestive tract and skeletal muscle. The results agree with symptoms of the disease and with published data on quantifications of virus in specific organs.--Copyright 1972, Biological Abstracts, Inc.
W73-12382

SOME EFFECTS OF ARTIFICIAL FERTILIZATION ON ENCLOSED PLANKTON POPULATIONS IN MARION LAKE, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
M. Dickman, and I. E. Efford.
Journal Fisheries Research Board of Canada, Vol 29, No 11, p 1595-1604, 1972. 6 fig, 1 tab, 24 ref.

Descriptors: *Plant populations, *Fertilizations, *Plankton, *Succession, *Canada, Nutrients, Seasonal, Primary productivity, Nitrates, Phosphates, Standing crops, Cyanophyta, Chlorophyta, Chrysophyta, Euglenophyta, Chlamydomonas, Eutrophication, Algae.
Identifiers: *Marion Lake (British Columbia), Cryptophyta.

Initial effects of fertilization on species composition and bloom formation, whether or not a predictable pattern occurs following lake fertilization and how such a pattern is influenced by seasonal differences were studied. Three different nutrient regimes were used in four plywood enclosures at two stations in Marion Lake, B.C., to determine whether the pattern is dependent on type of fertilization. After a single application of nutrients in the fall, summer, and spring, primary productivity increased within a 2-week period whether nitrate, phosphate, or a combination of the two was used. The species responding to the three nutrients generally differed both within and between seasons. In all seasons, there was a decrease in total plankton diversity (based on productivity) accompanied by an increase in relative productivity of a few phytoplankton species. Phosphate was most stimulatory during fall. During spring, N + P was most stimulatory and nitrate next. In summer, N + P was again most stimulatory. Of the species that increased in density, 78% were not detectable at time of fertilization. A rapid increase in density of rare species culminated in a bloom 2-3 weeks after fertilization. (Jones-Wisconsin)
W73-12384

STRATIGRAPHY OF FOSSIL PIGMENTS AS A GUIDE TO THE POSTGLACIAL HISTORY OF KIRCHNER MARSH, MINNESOTA,
Ohio Wesleyan Univ., Delaware. Dept. of Botany and Bacteriology.
J. E. Sanger, and E. Gorham.
Limnology and Oceanography, Vol 17, No 6, p 840-854. 12 fig, 31 ref.

Descriptors: *Analytical techniques, *Marshes, *Geologic history, *Aquatic productivity, Sediment, Stratigraphy, Pigments, *Minnesota, Allogenic succession, Organic matter, Sedimentation rates, Paleolimnology.
Identifiers: *Fossil pigments, *Postglacial, *Kirchner Marsh (Minn.).

Whether data on fossil pigments would substantiate conclusions previously drawn from pollen and macrofossil studies about ecological and limnological changes that occurred during postglacial time was tested in Kirchner Marsh, Minnesota. Successional developments in postglacial ecology and limnology, revealed by concentration and diversity of sedimentary plant pigments, include a

peak of aquatic production reached during the early postglacial warm, humid interval about 10,000 B.P. Production levels then declined. Very low levels of aquatic production are indicated by about 6,000 B.P. in the middle part of a warm, dry interval which was followed by low pigment concentrations (except for a brief interval about 5,000 B.P.) but with a marked rise in the ratio of chlorophyll derivatives to carotenoids, indicating an increase in allochthonous organic input accompanying the return of cooler moister conditions. The result was encroachment of oak forest on the prairie, followed by succession to reed-swamp on the lake. Pigment data are generally in harmony with the ecological conclusions from pollen and macrofossils, but they provide much more information on changes in aquatic productivity at the site. This studyprovides further strong evidence that stratigraphic analysis of sedimentary pigments can be of fundamental value in paleolimnology. (Jones-Wisconsin)
W73-12386

CORRELATED LIGHT AND ELECTRON MICROSCOPE STUDIES ON BROWN ALGAE. II. PHYSODE PRODUCTION IN DICTYOTA,
Leeds Univ. (England). Dept. of Plant Sciences.
L. V. Evans, and M. S. Holligan.
New Phytologist, Vol 71, No 6, p 1173-1180, 1972. 5 plates, 44 ref.

Descriptors: *Microscopy, *Cytological studies, *Phaeophyta, Electron microscopy, Marine algae, Plant morphology, Biochemistry.
Identifiers: *Physodes, *Dictoyota, *Trearddur Bay (North Wales).

The chemical nature and other attributes of large irregularly shaped bodies of varying electron-opacity, present within chloroplasts of thallus and reproductive cells of Dictoyota dichotoma, were explored. These bodies, apparently extruding into the cell cytoplasm, differ from the more conventional small, intensely osmiophilic chloroplast inclusions and appeared more abundant at some seasons that at others. Whether on their release into the cell cytoplasm the extruded products correspond to any of the large number of components described earlier as occurring in Dictyota cells was also explored. The physodes of fucosan vesicles in vegetative and reproductive cells originate in the plastids. Precursor material expelled from the chloroplast matrix, may run together to produce large physodes in cell cytoplasm. Staining reactions indicate the physodes are phenolic or tannin-like, perhaps photosynthetic products. Physodes in thallis apical region are exceedingly resistant and stable compared with those in older parts of thalli. In addition to the possible occurrence of several different kinds of physodes, a 'chemical evolution' of fucosan may occur according to season or in different parts of the thallus, a theory supported by differential reaction to osmium tetroxide by the larger, older physodes compared with the apical physodes. (Jones-Wisconsin)
W73-12388

STUDIES ON THE GROWTH OF PHAEODACTYLUM TRICORNUTUM. II. THE EFFECT OF ORGANIC SUBSTANCES ON GROWTH,
University Coll. of Swansea (Wales). Dept. of Botany.
J. Hayward.
Physiologia Plantarum, Vol 21, p 100-108, 1968. 3 fig, 3 tab, 29 ref.

Descriptors: *Plant growth, *Diatoms, *Organic compounds, Light, Phototropism, Carbon, Cultures.
Identifiers: *Phaeodactylum tricornutum, Heterotrophy.

Ability to grow heterotrophically appears in a number of genera and species through the major algal taxonomic divisions. There are indications of extremely limited heterotrophic ability among the Bacillariophyta and an apparent widespread occurence of obligate phototrophy. The possibility of heterotrophic nutrition of Phaeodactyllum tricornutum was studied by testing effects of a range of organic compounds upon its growth in the light. Results of experiments of 21 days duration at 18C under non-aerated conditions are expressed as percentage of growth in the basic mineral medium which is equated to 100. From the results obtained in the light a number of compounds were selected for testing as heterotrophic substances in the dark to determine any effect upon growth. No substance tested was capable of supporting growth of the diatom in the dark and it appears that the organism is obligately phototrophic. P. tricornutum is able to respire glucose, mannitol and lactate without the energy released being apparently available for growth. Some slight growth stimulation occurs in the light which appears to be partly due to occurrence of trace element impurities in the organic compounds. (Jones-Wisconsin)
W73-12389

PROCEEDINGS OF SEMINAR ON EUTROPHICATION AND BIOSTIMULATION.
California State Dept. of Water Resources, Sacramento.

Held at Clear Lake, California, Oct 19-21, 1971. November 1972. 229 p, 66 fig, 21 tab, 300 ref.

Descriptors: *Conferences, *Eutrophication, *Biological communities, Carbon, Inorganic compounds, Nutrients, Nitrogen, Phosphorus, Detergents, *California, Biochemistry, Sediment-water interfaces, Tile drainage, Geochemistry, Oxidation-reduction potential, Light, Temperature, Solar radiation, Photosynthesis, Productivity, Zooplankton, Management, Nutrient removal, Economics, Mathematical models, Phytoplankton, Hydraulic aspects, Bioassay, Algae, Sewage effluents, Growth rates, Waste water treatment, Oil pollution, Diatoms, Polychlorinated biphenyls, DDT, Limiting factors.
Identifiers: *San Francisco Bay-Delta, Algal growth potential.

This seminar was conducted for the purpose of defining, controlling, or limiting eutrophication in lakes and reservoirs. Papers were presented on the following subjects: The effect of inorganic carbon on eutrophication; Nitrogen: Recent studies on the role of nitrogen in the biostimulation and eutrophication of aquatic ecosystems; Phosphorus and eutrophication; Sediment-water nutrient interchange in eutrophic lakes; Effects of light and temperature on algal growth; The role of zooplankton in the process of eutrophication; Nutrient control in north San Francisco Bay; Mathematical modeling of phytoplankton populations; Algal bioassays: Examples, advantages and limitations of current approaches; AGP studies in the San Francisco Bay-Delta; PCBs and DDT. (See W73-12392 thru W73-12402) (Auen-Wisconsin)
W73-12391

THE EFFECT OF INORGANIC CARBON ON EUTROPHICATION,
Utah Water Research Lab., Logan.
Joel C. Goldman.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 3-53. 10 fig, 7 tab, 155 ref.

Descriptors: *Eutrophication, *Carbon, *Limiting factors, Inorganic compounds, Nutrients, Nitrogen, Phosphorus, Carbon cycle, Productivity, Alkalinity, Hydrogen ion concentration, Enzymes, Chemical reactions, Laboratory tests, Carbon dioxide.
Identifiers: *Inorganic carbon, Carbonic anhydrase, Carbon sources.

The role of carbon in controlling algal growth in natural waters, carbon cycling and metabolism, inorganic carbon chemistry, algal utilization of carbon, and concepts of nutrient limitation are discussed and reviewed. Organic carbon compounds may be synthesized from carbon dioxide through three types of reactions--photosynthesis by plants and algae, photosynthesis by certain bacteria, and carbon incorporation by other mechanisms. Extraction of carbon dioxide from an algal growth system through assimilation into algal biomass faster than it can be replaced through atmospheric carbon dioxide diffusion, respiration, fermentation processes, and readjustment of solid carbonate equilibria leads to increased pH. The slowest reaction involved in the chemical transformation of the ionic forms of inorganic carbon to free carbon dioxide could be rate limiting if carbon were limiting in an algal bloom and could be the controlling factor governing utilization of inorganic carbon in photosynthesis. What specific role the enzyme, carbonic anhydrase, has in relation to uptake of inorganic carbon by algae in natural waters still needs clarification. It is concluded that carbon limits productivity only under certain well defined conditions that occur relatively infrequently in nature. (See also W73-12391) (Jones-Wisconsin)
W73-12392

NITROGEN: RECENT STUDIES ON THE ROLE OF NITROGEN IN THE BIOSTIMULATION AND EUTROPHICATION OF AQUATIC ECOSYSTEMS,
Clear Lake Algal Research Unit, Lakeport, Calif.
Alexander J. Horne.
In: Seminar Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 55-70. 3 fig, 2 tab, 38 ref.

Descriptors: *Nitrogen, *Eutrophication, Nitrogen compounds, Nitrogen cycle, Limiting factors, Sea water, Freshwater, Marshes, Lentic environment, Nitrogen fixation, Algae, Productivity, Water pollution sources, Dentrification, Abatement, *California.
Identifiers: Nitrogen sources, *Clear Lake (Calif).

Role of nitrogen in eutrophication and biostimulation, biological methods of introduction of new nitrogen into aquatic ecosystems, and the essential conservatism of these systems is discussed in the light of recent work. It should be noted that the two major changes in physical state of nitrogen, denitrification and nitrogen fixation, occur in anoxic conditions or at least conditions of low dissolved oxygen. In almost all circumstances N-limitation, if it occurs, will be a temporary phenomenon subject to variations. N-limitation, seems to be found in marine, freshwater and marshy areas; examples are given. Areas shown to be N-limited are highly mixed or upwelling areas of open and coastal oceans, estuaries, and some freshwater lakes. The importance in eutrophication control of reducing N-inflow before it reaches the lake or sea is demonstrated. The approximate amount of accelerated eutrophication from a known N-input could be predicted because N forms an essential and reasonably constant percentage of body weight. The real effect on accelerated eutrophication depends on basin morphology. Contributions of nitrogen fixation to some lake budgets over the world are listed. (See also W73-12391) (Jones-Wisconsin)
W73-12393

PHOSPHORUS AND EUTROPHICATION,
California State Dept. of Water Resources, Sacramento.
Randall L. Brown, Donald B. Porcella, and Daan Toerien.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 71-81. 4 fig, 10 ref.

Descriptors: *Phosphorus, *Eurtophication, *Limiting factors, Detergents, Waste water (Pollution), Algae, Metabolism, Biochemistry, Phosphates, Scenedesmus, Phosphorus compounds, Nutrients, Nitrogen, *California, Growth rates, Nutrient removal, Tile drainage, Productivity.
Identifiers: San Joaquin Valley (Calif.), Firebaugh (Calif.), San Francisco Bay-Delta (Calif.), Phosphorus removal.

The relationship between phosphorus and algae is summarized in an attempt to provide some clarification of the role of phosphorus in algal metabolism. Phosphorus must be in orthophosphate form to enter into biochemical reactions within the cell; thus despite the publicity of P-containing detergents, they contain only the polyphosphate form which is not readily assimilated by algae. The exact role of phosphorus in algal metabolism is complicated by the changes in solubility of phosphorus compounds during algal growth stages and is also based on growth kinetics. The majority opinion is that, apparently, silicon may become limiting in the San Francisco Bay-Delta and algal populations may shift from predominantly diatoms to green algae. Lakes and reservoirs may act as their own phosphorus source when P entering the body of water is deposited on the bottom either as organic P bound in the algae or inorganic sediments and phosphorus precipitates. Phosphorus removal from influent water by alum or lime precipitation can be effective and economical in removing more than 95% of phosphorus in sewage; in situ reduction is accomplished by adding alum. Whether this waste treatment can be rationally defended in terms of the amount of environmental enhancement obtained per dollar expended is debatable. (See also W73-12391) (Jones-Wisconsin)
W73-12394

SEDIMENT-WATER NUTRIENT INTERCHANGE IN EUTROPHIC LAKES,
Utah Water Research Lab., Logan.
Donald B. Porcella, Kirk L. Schmalz, and William A. Luce.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, Caliornia, p 83-109. 1 fig, 5 tab, 23 ref.

Descriptors: *Sediment-water interfaces, *Nutrients, *Eutrophication, Algae, Biochemistry, Geochemistry, Cycling nutrients, Sorption, Chemical precipitation, Oxidation-reduction potential, Bottom sediments, Mixing, Distribution, Absorption, Productivity, Phosphorus, *Utah.
Identifiers: *Hyrum Reservoir (Utah).

Sediment role in controlling nutrient availability in eutrophic lakes is predicated on algal bloom relationship to sediment nutrients; the sediment nutrient materials available are nutrients reduced in overlying waters and their amount depends on duration of the bloom after restriction of nutrient input. Overall process involves physical sorption, chemical precipitation, and biological nutrient uptake from solution; then particulate inorganic and organic material is transferred to the bottom by settling or biological mechanisms. Chemical changes in sediments brought about primarily by microbial decomposition of organic matter result in organic matter mineralization as well as anaerobic conditions, which change the oxidation-reduction potential. In both eutrophic and oligotrophic lakes, sediments tend to accumulate more nutrients than they contribute to overlying water. Estimation of nutrient cycling through various release mechanisms indicates that considerable release does occur and an algal bloom could possibly be sustained by sediment-derived nutrients. Although phosphorus release may sustain an algal bloom, the rate is insufficient, under natural conditions, to maintain high algal concentrations when influent phosphorus is lowered. It seems feasible to determine release and accumulation rates and to develop descriptive models (including the different nutrients and their compartments) in order to evaluate the practical significance of sediment nutrient sink to algal productivity. (See also W73-12391) (Jones-Wisconsin)
W73-12395

EFFECTS OF LIGHT AND TEMPERATURE ON ALGAL GROWTH,
California State Dept. of Water Resources, Sacramento.
Randall L. Brown.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 111-131. 12 fig, 1 tab, 17 ref.

Descriptors: *Light, *Temperature, *Algae, *Plant growth, Solar radiation, Photosynthesis, Eutrophication, Light intensity, Pigments, Chlorophyll, Light penetration, Energy conversion, Metabolism, Nitrogen, Limiting factors, *California, Productivity.
Identifiers: San Joaquin Delta (Calif), Lake Tahoe (Calif-Nev).

In consideration of eutrophication and biostimulation, light availability to algal cells at a certain depth is determined by several factors and can be described by a modification of the Beer-Lambert law. Plant cells capture light energy by use of photosynthetic pigments, including chlorophylls, carotenes, xanthophylls, and phycobilins. Two pigments, chlorophyll-a and beta carotene, are found in the four major algal groups. Light effect on algal metabolism has been studied using both laboratory and field assays. General shape of the algal response to different light levels is illustrated. If algae develop under stable illumination, cells can become adapted to either high or low light. Algae can exhibit either positive or negative phototaxis. Algal responses directly affected by temperature include metabolism, reproduction, and distribution. Effect of temperature on light saturation intensity of a mixed population of Scenedesmus and Chlorella is illustrated. Of the two factors, light and temperature, light probably has a more direct effect, although temperature has an important indirect effect. The practical implications of the role of light in growth and metabolism appears when placing the blue-green algae in a light environment unfavorable for their growth. Other algae may then dominate. (See also W73-12391) (Jones-Wisconsin)
W73-12396

THE ROLE OF ZOOPLANKTON IN THE PROCESS OF EUTROPHICATION,
California Univ., Davis., Div. of Environmental Studies.
Peter J. Richerson.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 133-140. 1 fig, 1 tab, 10 ref.

Descriptors: *Water quality control, *Zooplankton, *Eutrophication, *Grazing, Algae, Phytoplankton, Crustaceans, Copepods, Rotifers, Cyanophyta, Productivity, California, Nevada, Daphina, Bacteria, Detritus, Management, Fish.
Identifiers: Kellicottia, Asplanchna, Diaptomus oregonesis, Keratella, Polyarthra, Lake Tahoe (Cal.-Nev.), Bosmina, Moina, Lake Erken (Sweden), Clear Lake (Calif.).

The process of zooplankton grazing and its impact upon algal populations as a possible management technique to alleviate eutrophication problems is examined. Grazing rates are expressed as clearing volumes--volume of water filtered (cleaned) of algae or other particles of a defined type per unit time--and are measured for common representatives of important freshwater zooplankton. Zooplankton often exhibit considerable selectivity in their grazing and there are usually pronounced difference in feeding efficiency depending upon the size of the algae. Many blue-green algae are not grazed at all, perhaps contributing to the obnoxious blooms. Phytoplankton biomass seems to cause an increase in zooplankton, which then graze the phytoplankton intensely, reducing phytoplankton biomass, although other hypotheses could be operative. It appears from the estimations presented that grazing is more likely to be a dominant term in the biomass equation in eutrophic than oligotrophic lakes. Zooplankton grazers may derive a significant proportion of their nutrition from sources other than algae, perhaps detritus and bacteria. Several schemes are conceivable in considering zooplankton as populations whose manipulation might contribute to control of algal blooms. Although management of zooplankton for control of eutrophication symptoms is not impossible, no proven techniques exist at present. (See also W73-12391) (Jones-Wisconsin)
W73-12397

NUTRIENT CONTROL IN NORTH SAN FRANCISCO BAY,
Brown and Caldwell, Inc., San Francisco, Calif.
Richard C. Bain, Jr., and Lyle N. Hoag.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 141-162. 9 fig, 29 ref.

Descriptors: *Productivity, *Nutrient removal, *Control, *California, Water quality control, Management, Nitrogen, Phosphorus, Seasonal, Eutrophication, Carbon, Waste water treatment, Algae, Limiting factors, Silica, Diatoms, Standards, Water pollution control.
Identifiers: North San Francisco Bay (Calif.), Antioch (Calif.), Suisun Bay (Calif.), Nitrogen removal.

The San Francisco Bay-Delta area is being studied for a water quality management plan. The present water quality, the rationale for nutrient control, monitoring, source control, treatment processes, and need for nutrient removal are considered. Evaluation of total nutrient content includes nutrient content of algal cells as well as remaining inorganic nutrients in the water mass. Measurement of nutrient forms and density of algal crops provide needed data to help interpret biostimulatory effects. Importance of various nutrients for a particular area can best be determined through evaluation of seasonal spatial nutrient dynamic in the water, algal bioassays with various nutrient inocula and consideration of effluent and receiving water quality relative to chemical composition of algal cells. Phosphorus controls are needed to insure against nutrient imbalance which may cause undesired shifts in dominance of algal forms particularly in view of possible increased clarity and decreased dissolved silica resulting from reduced Delta outflow. Although little economic pressure on dischargers has been applied, as more sewerage agencies are required to remove nutrients, ordinances and industrial service charges will reflect the resulting costs, giving an economic incentive to nutrient source control. Various nutrient removal processes are currently available to wastewater treatment designers. (See also W73-12391) (Jones-Wisconsin)
W73-12398

MATHEMATICAL MODELING OF PHYTOPLANKTON POPULATIONS,
Hydroscience, Inc., Westwood, N.J.
Austin W. Nelson.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 163-172. 5 fig.

Descriptors: *Water quality control, *Mathematical models, *Phytoplankton, Management, Water quality, Growth rates, Physical properties, Estua-

ries, Hydraulic aspects, Temperature, Respiration, Solar radiation, Photosynthesis, Zooplankton, Nutrients, Deltas, Grazing, Light intensity, Mortality, *California, Forecasting.
Identifiers: Antioch (Calif.), *Suisun Bay (Calif.).

Because of nonlinearity of interrelationships among variables governing phytoplankton growth, growth rates are not simply determined. A mathematical model considering combined, changing effects of variables determining growth rates was developed. The factors which combine to determine the abundance of phytoplankton in a body of water include: the physical environment consisting of the hydraulic regimen transporting phytoplankton, water temperature governing rates of growth and respiration, and incident solar radiation providing energy to support photosynthesis; the zooplankton population which, preying upon the phytoplankton, is thus dependent upon the abundance of phytoplankton; the nutrient supply which is regulated by hydraulic transport. Nutrients are depleted as they are consumed by growing phytoplankton, and the supply may be augmented by nutrients contained in local waste discharges. The model has been verified using data collected during 1966 in a portion of the Sacramento-San Joaquin Delta and Suisun Bay. After having been adjusted to reproduce the 1966 data, the model was used to predict phytoplankton populations resulting from an increase in nutrient discharges to the study area. (See also W73-12391) (Jones-Wisconsin)
W73-12399

ALGAL BIOASSAYS: EXAMPLES, ADVANTAGES, AND LIMITATIONS OF CURRENT APPROACHES,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
Milton G. Tunzi.
In: Seminar on Eutrophication and Biostimulation, October 1921, 1971, Clear Lake, California, p 173-197. 9 fig, 4 tab, 7 ref.

Descriptors: *Analytical techniques, *Algae, *Bioassay, Photosynthesis, On-site tests, Cultures, Laboratory tests, Testing procedures, Plant growth, Eutrophication, Productivity, Sewage treatment, Agriculture runoff.
Identifiers: Flasks, Static batch cultures, Chemostats.

Algal bioassays to determine the limiting major or minor nutrient for growth, set nutrient levels to avoid algal problems, locate algal bloom caused when several inflows are involved, and determine desirability of probable inflows are evaluated. There are three basic approaches in determining algal cell responses: photosynthetic rate measurements, static flask cell-mass cultures, and chemostat steady-state systems. The photosynthetic approach has been particularly applicable to field in situ assays while the static flask in applicable to laboratory long-term experiments. Recently, chemostats have been proposed as the better approach to algal bioassays because they provide realistic estimates of the algal growth parameters. The applicability of the three methods depends upon the type of data desired, time consideration, economic factors, and the environment under study. Photosynthetic measurements are the best approach to in situ studies. Flasks or static batch cultures give rapid information on algal response to varying concentrations of biostimulants. Chemostat systems are more suitable for long-term studies when time, money, and trained personnel are ample. The kinetic constants evolved can be used to make predictions about yield and algal mass produced by a constant pollution inflow into a receiving water. (See also W73-12391) (Jones-Wisconsin)
W73-12400

AGP STUDIES IN THE SAN FRANCISCO BAY--DELTA,
California State Dept. of Water Resources, Sacramento.
Randall L. Brown.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 199-221. 10 fig, 2 tab, 12 ref.

Descriptors: *Productivity, *Algae, *California, *Bioassay, Monitoring, Nutrients, Waste treatment, Technology, Diatoms, Chlorophyta, Cyanophyta, Nitrogen, Tile drainage, Phosphorus, Chlorophyll, Toxicity, Sewage effluents, Oil pollution, Waste identification, Municipal wastes, Silica, Methodology, Analytical techniques.
Identifiers: *Algal growth potential, San Francisco Bay-Delta (Calif.), San Joaquin River (Calif.), San Pablo Bay (Calif.), Delta-Suisun Bay (Calif.).

A review is presented of the available data accumulated by assays to determine effects of various nutrients on algal growth in the San Francisco Bay-Delta and/or to evalutate the effects of treatment processes on biostimulation. The use of algal growth potential data is put in perspective. Summaries of some studies are: The conclusion in the 1967 EPA report is that the addition of nitrogen from agricultural drainage will increase algal growth in the Bay-Delta waters. Nitrogen removal studies by biological treatment at the Agricultural Wastewater Treatment Center indicate that P alone had no effect, N alone caused increased growth, and N + P resulted in the most pronounced effect in tile drainage mixed with San Joaquin River water. The Kayser report indicates that, generally, nitrate increased maximum cell numbers (except in Lower Bay) and had little effect on growth rate. Secondary municipal or refinery effluent was either inhibitory or stimulatory depending on the waste concentrations and water source, although usually activated sludge effluent was stimulatory. Results of an 18-month study of the effects of waste discharges on Bay organisms are summarized. A method of using organisms from lower trophic levels (bacteria, algae, protozoa) to bioassay specific compounds and complex municipal wastes was developed. (See also W73-12391) (Jones-Wisconsin)
W73-12401

PCBS AND DDT,
Environmental Protection Agency, San Francisco, Calif. Water Quality Office.
Gerald L. Muth.
In: Seminar on Eutrophication and Biostimulation, October 19-21, 1971, Clear Lake, California, p 223-226. 3 fig.

Descriptors: *Polychlorinated biphenyls, *DDT, *Molecular structure, Gas chromatography, Pesticides, Chemical analysis, Water sampling, Chlorinated hydrocarbon pesticides, *Pollutant identification.

Chemical analysis to determine presence and concentration of the organic compounds, PCBs (polychlorinated biphenyl) and DDT (dichlorodiphenyl-trichloroethane) in aquatic environments is difficult because of their similar molecular structures. As with the PCBs, the chlorine atoms of DDT can be located at different sites. In contrast to the PCBs, each DDT molecule will contain only two chlorine atoms. When produced the DDT will be approximately 80% pp'DDT and 12% op DDT, with the remaining 8% having other configurations including DDD. The two compounds can be distinguished from each other by using more than one gas chromatographic column with differing liquid phases. The procedure includes a standard hexane extraction, florish clean up, and then gas chromatographic determination. The computerized gas chromatographic mass spectrograph is used as final proof to determine the existence and differentiation between PCBs and other pesticides. The gas chromatographic peaks of the PCBs overlap not only with DDT, but also with lindane, aldrin, DDE, and other pesticides. DDT and PCBs also react similarly in aquatic environments; both accumulate in the fatty tissues of organisms, exhibit bio-magnification, are non-soluble in water, sorb onto sediment particles, and exhibit similar toxicity. (See also W73-12391) (Jones-Wisconsin)
W73-12402

THE SHAGAWA LAKE PROJECT: LAKE RESTORATION BY NUTRIENT REMOVAL FROM WASTEWATER EFFLUENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W73-12520

DETOXIFICATION OF KRAFT PULP MILL EFFLUENT BY AN AERATED LAGOON,
International Pacific Salmon Fisheries Commission, New Westminister (British Columbia).
For primary bibliographic entry see Field 05D.
W73-12529

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wis., ($12.00). Bibliographic Series, No 253, 1972. 141 p, 408 ref.

Descriptors: *Water pollution, *Bibliographies, *Pulp and paper industry, *Aquatic life, *Water pollution effects, Pollutants, Streams, Lakes, Oceans, Running waters, Aquatic animals, Aquatic plants, Toxicity, Industrial wastes, Pulp wastes, Effluents, Fish behavior, Fish, Waste water (Pollution).

This third part of a six-part annotated and indexed bibliography gives references to the ecological effects of various paper industry pollutants on rivers, lakes, oceans, and on their aquatic flora and fauna. The cited literature covers items published between about 1950 and 1970. (See also W73-12553) (Brown-IPC)
W73-12555

HEAVY METALS IN THE ENVIRONMENT.
For primary bibliographic entry see Field 05B.
W73-12604

ENVIRONMENTAL CONTAMINATION BY TOXIC METALS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05B.
W73-12605

ARSENIC AND CADMIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
S. L. Wagner.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 45-57, January 1973. 21 ref.

Descriptors: *Pollution effects, *Heavy metals, *Human pathology, *Arsenic, *Cadmium, Public health, Toxicity, Trace elements, Hazards.

Arsenic is ubiquitous in our environment and can be found in air, soil, or water. Most concentrations in water and air are in the range of a few parts per billion, whereas soil concentrations are often a few parts per million. The element does not appear

to accumulate in the food chain, and most foods do not contain high concentrations of arsenic with the single exception of seafoods. For example, whereas an arsenic tolerance in foods has been established as about 3 ppm, seafoods normally contain concentrations of arsenic ranging from 2 to 30 ppm. Cadmium occurs naturally in only trace amounts with the exception of a relatively high concentration found in association with zinc and lead. Most exposure has been from occupational exposure in workers involved in battery manufacture, electroplating, the making of alloys, welding and solders, ceramics, and vapor lamps. Cadmium is believed to inhibit the synthesis of iron into hemoglobin, and therefore may produce a secondary type of iron deficiency anemia. As with arsenic, the compound generally exhibits toxicity via the gastrointestinal route, but, again, the inhalation of cadmium fumes is much more toxic than the ingestion of the cadmium salts. Present threshold limit value for cadmium oxide is 0.1 mg per cu m of air. (See also W73-12604) (Woodard-USGS)
W73-12607

EFFECT OF HEAVY METALS ON FISH,
National Environmental Research Center, Corvallis, Oreg. Western Fish Toxicology Station.
G. Chapman.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 141-162, January 1973. 5 tab, 23 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Fish, Toxicity, Ecology, Ecosystems, Food chains, Water chemistry, Trace elements, Chemical reactions, Water properties, Zinc, Copper, Cadmium.
Identifiers: *Pollution tolerance (Fish).

A review of literature with respect to the toxicity to fish of the heavy metals, zinc, copper, and cadmium, showed a wide range of values (for each metal), which were cited as 96-hr LC50 values, i.e., the concentration which kills 50% of the test animals in 96 hours. For zinc this range was 90 to 40,900 ppb; for copper 46 to 10,000 ppb; and for cadmium 470 to 9,000 ppb. Two general conclusions are that toxicity varies inversely with hardness, and that salmonids (trout and salmon) are more susceptible than most other common test species (primarily bluegills, Micropterus salmoides; and goldfish, Carassius auratus; and perhaps fathead minnows, Pimephales promelas.) Disregarding species and age, all of the other generally recognized factors which influence the toxicity of heavy metals to fish largely do so by influencing the rate of accumulation of the metal and, primarily, the rate of uptake of the metal. Thus pH, hardness and alkalinity, temperature, and dissolved oxygen level all affect the rate of uptake of the metal by changing either the biological availability of the metal by altering its form or by altering the rate and volume of ventilation of the fish. (See also W73-12604) (Woodard-USGS)
W73-12611

EFFECTS OF METALS ON FERTILIZATION AND DEVELOPMENT IN FISH,
Oregon Cooperative Fishery Unit, Corvallis.
J. D. McIntyre.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 163-168, January 1973. 8 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Fish reproduction, Spawning, Fish eggs, Fish physiology, Toxicity, Trace elements, Fish types.
Identifiers: *Pollution tolerance (Fish).

A literature review shows that successful fertilization of fish may be prevented by toxic metals through effects on behavior. In long term studies of the effects of metals on various life history stages of the brook trout, males in exposure levels of 3.4 ppb cadmium were seized by severe muscle spasms as females began to move gravel in redd preparation. These males were generally unsuccessful in fertilizing the eggs and eventually died. Direct effects of metals on gamete survival may prevent successful fertilization. Results of an acute test in which samples of steelhead trout sperm were held in various concentrations of methylmercuric chloride for 30 minutes before they were combined with eggs indicated that at concentrations greater than 1 ppm, sperm viability was markedly reduced. The sexual development of fathead minnows in methylmercury is arrested at 0.25 ppb. Zebra fish that were permitted to spawn in several concentrations of phenylmercuric acetate produced fewer eggs at concentrations of 1 ppb or more as compared to lower concentrations. (See also W73-12604) (Woodard-USGS)
W73-12612

THE ROLE OF HEAVY METALS IN BIOLOGY,
Harvard Medical School, Boston, Mass.
F. S. Kennedy.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Resources Research Institute Report SEMN WR 016.73, p 169-182, January 1973. 1 tab, 2 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Public health, *Human pathology, *Biochemistry, Environmental effects, Chemical reactions, Enzymes, Toxicity, Mercury, Cadmium, Lead.

The known biological involvement of mercury, cadmium, and lead can be expressed largely through their ability to form stable complexes with numerous biological ligands. These include SH and imidazole side chains of proteins, nitrogenous bases of DNA and RNA, as well as phosphate groups which occur in phospholipids, DNA and RNA, coenzymes, vitamins and metabolites. Aside from their widely known toxicity, mercury, cadmium, and lead all induce or enhance enzymatic activity in a large number of enzymes. Thus, when either mercury, cadmium, or lead is added to metal-free, bovine pancreatic carboxypeptidase A (a dual specificity zinc metalloenzyme), the reconstituted metalloenzymes all activity catalyze ester hydrolysis, the cadmium enzyme being a more active esterase then the natives zinc enzyme. However, unlike the native enzyme, the heavy metal substituted carboxypeptidases exhibit no peptidase activity so that cadmium can be regarded as both an activator and an inhibitor for this enzyme. That metals play a highly complex role in biological processes is obvious in the case of transition metals, which have been studied more extensively. For these, numerous metal ion deficiencies and diseases have been established including diseases which result from metal ion antagonisms or imbalances where deficiences of one metal relate to abnormal levels of second. (See also W73-12604) (Woodard-USGS)
W73-12613

SELENIUM IN THE ENVIRONMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
P. H. Weswig.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institute Report SEMN WR 016.73, p 183-203, January 1973. 21 ref.

Descriptors: *Water pollution effects, *Heavy metals, *Public health, *Human pathology, *Animal pathology, Toxicity, Trace elements, Water pollution sources, Grasses.
Identifiers: *Selenium, Pollution tolerance.

Selenium is a relatively scarce element, its mean content in the crust of the each is about 0.09 ppm, and it is 66th in order of abundance. Selenium occurs especially in association with sulfur deposits and may also be found in combination with elements such as iron, lead, copper, and arsenic. In most soils not derived from sedimentary rocks the selenium concentration may be in the order of 0.05 ppm. In sea-bottom sediments and sedimentary rocks selenium values may be as high as 1.2 ppm. However, there are certain seleniferous regions in the world with much greater concentrations of selenium. In addition to South Dakota and Wyoming, seleniferous areas have been reported in Canada, Mexico, Ireland, Australia, Israel, and China. The safe upper limit for selenium in drinking water is 10 ppb according to the U.S. Department of Health. The presence of selenium in surface waters is a function of both pH and drainage slope with the highest concentrations coming generally from specific spring waters. Plants which grow on soils rich in selenium may concentrate the selenium and cause death to the animal consuming them. In Wyoming and North Dakota there are more then 24 species which may be classified as accumulators. Chronic selenium poisoning is caused by consuming plants containing from 10-30 ppm selenium. (See also W73-12604) (Woodard-USGS)
W73-12614

THE ZOOPLANKTON OF THE GULF OF GUINEA,
For primary bibliographic entry see Field 05A.
W73-12623

CRUSTACEAN PLANKTON AND THE EUTROPHICATION OF LAKES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
K. Patalas, and A. Salki.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 519-542, April 1973. 14 fig, 8 tab, 19 ref.

Descriptors: *Eutrophication, *Zooplankton, *Crustaceans, *Copepods, *Waterfleas, Invertebrates, Spatial distribution, Dominant organisms, Oligotrophy, Mesotrophy, Secondary productivity, Secchi disks, Specific conductivity, Dissolved solids, Calcium, Sodium, Potassium, Magnesium, Trophic level, Chlorides, Dissolved oxygen, Water sampling, Sulfates, Water temperature, Lake Ontario, Physical, Chemical properties, Thermal stratification, Hypolimnion, Epilimnion, Phosphorus, Nutrients, Oxygen sag, Deficient elements.
Identifiers: *Okanagan Lake, *Skaha Lake, *Osoyoos Lake Macroinvertebrates, Phosphorus load, Species abundance, Cyclops bicuspidatus thomasi, Diaptomus ashlandi, Diaphanosoma leuchtenbergianum, Daphnia longiremis, Daphnia thorata, Wood lake, Kalamalka Lake, Lake Washington, Vertical distribution, Horizontal distribution, Transparency, Bosmina longirostris, Bosmina coregoni longispina, Leptodora kindtii, Diphnia pulex, Daphnia schoedleri, Sida crystallina, Epischura nevadensis, Nauplii, Copepodids, Cyclops vernalis, Lake Mendota, Scapholeberis mucronata, Diaphanosoma brachyurum, Holopedium gibberum.

In early September 1969 and late August 1971, the vertical and horizontal distribution of temperature, Secchi disc visibility, some chemical components, and zooplankton abundance in lakes Okanagan, Skaha, and Osoyoos were investigated. Lakes Kalamalka and Wood were sampled only in late August 1971. Four different basins could be distinguished in Lake Okanagan; total dissolved

solids, calcium, and electrical conductivity within the lake decreased gradually from north to south. Macroelement values within lakes Okanagan, Skaha, and Osoyoos were apparently not substantially different but Kalamalka and Wood lakes were about twice higher in sodium, potassium, magnesium and about 1.5 higher in the total dissolved solids. Four species of copepods and nine species of cladocerans were found with Cyclops bicuspidatus thomasi and Diaptomus ashlandi dominant in all five lakes. Diaphanosoma leuchtenbergianum and Daphnia longiremis were the most common cladocerans in all five lakes. Daphnia thorata was common in all except Wood Lake. Eighty-nine percent of the total plankters in Lake Okanagan were located in the upper 50-m layer. Relatively little horizontal variation was found within the lake but two areas showed in both years greater abundance of plankton than the remaining areas. Crustaceans were usually less abundant inshore than offshore. Volume of settled net plankton varied from 8 cu mm/sq mm in Okanagan Lake to 31 cu mm/sq mm in Wood Lake. No substantial changes in species composition of zooplankton, Secchi disc visibility, and dissolved oxygen in the hypolimnion were found relative to the data of 1935 reported by Rawson. In 1969 and 1971 net plankton volumes were about five and three times larger, respectively, than in 1935. Calculations of total phosphorus load indicated that lakes Okanagan and Kalamalka are still in the oligotrophic range but close to mesotrophy. Lake Wood is moderately eutrophic and lakes Skaha and Osoyoos showed a marked degree of eutrophy. The estimates for lakes Wood, Skaha, and Osoyoos were supported by the values of the hypolimnetic areal deficits characteristic for highly eutrophic lakes. The trend of changes in phosphorus load during the past century is presented and predictions are made about the load in 1990 in situations with and without phosphorus removal from sewage. (Holoman-Battelle)
W73-12624

BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS-ANALYSIS AND BIBLIOGRAPHY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. Toetz, J. Wilhm, and R. Summerfelt.
Available from the National Technical Information Service as PB-214 121, $3.00 in paper copy, $1.45 in microfiche. Report No. REC-ERC-72-33, October 1972. 119 p, 19 fig, 2 tab, 339 ref.

Descriptors: *Bibliographies, *Lakes, *Reservoirs, *Documentation, *Environmental effects, Water quality control, Impoundments, Physical properties, Water pollution effects, Trophic level, Thermal stratification, Chemical properties, On-site investigations, Laboratory tests, Benthos, Biological communities, Destratification, Biogeochemistry, Hypolimnion, Organic matter, Carbon dioxide, Hydrogen ion concentration, Oxidation, Turbidity.
Identifiers: *Data interpretation, *Artificial destratification, *Artificial aeration, *Applied research, *Biological effects, Mechanical devices, Transparency, Macroinvertebrates, Chironomids, Ephemeroptera, Silicon, Submerged weirs, Vertical distribution, Section Four Lake, Cox Hollow Lake, Lake Wohlford, Particulate nitrogen, Particulate matter, Kjeldahl nitrogen, Chironomus anthracinus, Ilyodrilus hammoniensis, Tubifex tubifex.

The state of the art of research concerning the biological effects of reaeration and destratification is described, with emphasis on lakes and reservoirs. Research needs are discussed, based on this review. Useful descriptions of methods and devices of reaeration and destratification are included. (Holoman-Battelle)
W73-12625

BIOLOGICAL EFFECTS OF OIL POLLUTION - SELECTED BIBLIOGRAPHY II,
Edison Water Quality Research Lab., N.J.
R. J. Nadeau, and T. H. Roush.
Available from the National Technical Information Service as PB-213 483, $4.50 in paper copy, $1.45 in microfiche. Report No. EPA-R2-72-055, November 1972. 62 p, 659 ref. EPA Project 15080 NDE.

Descriptors: *Bibliographies, *Documentation, *Oil pollution, *Water pollution effects, *Aquatic life, Environmental effects, Oily water, Shellfish, Marine animals, *Aquatic animals, Invertebrates, Dissolved oxygen, Microbial degradation, Oil spills, Oil industry, Ecosystems, Path of pollutants, Biological communities, Toxicity, Water birds, Benthos, Aquatic plants, Marine plants, Taste, Zooplankton, Sea water.
Identifiers: Natural waters, Carcinogenicity, Fate of pollutants, Crude oil, Hydrocarbons, Coastal waters, Grease, Substrate utilization, Petroleum residues, Mineral oil, Oil characterization, Aromatic compounds, Fuel oil, Marine environment, Diesel oil, Minnesota River, Sublittoral, 3 6 9 12 15 18-heneicosahexane, Petroleum distillates, Oil dispersants, Cod (Fish), Mytilus californianus, Morone saxatilis, Roccus saxatilis, Salmo gairdneri, Clupea carpio, Mugil cephalus.

This bibliography is an updating of the Federal Water Pollution Control Administration's 1969 report number DAST-19. References on the biological effects of oil include general aspects, specific spill incidents, general effects, carcinogenic effects, nicrobial utilization, and the effects on birds, fish, shellfish, marine and freshwater invertebrates, plants, and dissolved oxygen. (See also W70-02038) (Holoman-Battelle)
W73-12626

BIOLOGICAL ASPECTS OF LEAD: AN ANNOTATED BIBLIOGRAPHY - LITERATURE FROM 1950 THROUGH 1964. PARTS I AND II,
Cincinnati Univ., Ohio. Coll. of Medicine.
I. R. Campbell, and E. G. Mergard.
Available from GPO $6.75 a set NTIS microfiche $1.45 as PB-210 884. Report No AP-104, May 1972. 935 p, 4103 ref. Contract No. CPA 22-69-48. Grant No. USPHS ES 00159.

Descriptors: *Lead, *Bibliographies, *Abstracts, *Analytical techniques, *Lead radioisotopes, *Surveys, *Pollutant identification, Water pollution effects, Chemical analysis, Soil contamination, Documentation, Conferences, Public health, Water pollution, Air pollution, Path of pollutants, Human pathology, Phytotoxicity, Microorganisms, Pesticides, Waste water (Pollution), Legal aspects, Animal pathology.
Identifiers: *Organolead compounds, *Toxicology, *Pollutant effects, Mobilization, Fate of pollutants, Bioaccumulation, Biological materials, Quantitative analysis, Plants, Macroinvertebrates, Pb-212, Pb-210, Atomic absorption spectrometry, Pb-204, Pb-207, Pb-206, Pb-208, Natural waters, Marine environment, Chemical composition, Enzymatic inhibitors, Blood, Complexation, Metal chelates, Tunicates, Gasoline, Petroleum products, Excretion, Histochemistry, Plastics, Urine.

This bibliography has been compiled from several abstract sources and represents the scientific periodical literature covered by the principal abstracting and indexing services. Books and proceedings of conferences and symposia devoted to lead and its compounds are also included. The material is arranged in 10 sections covering such areas as environmental surveys, plants and animals, man, occupational exposure, pollution and effects, legal aspects, analytical methods, and chemistry and technology. (Holoman-Battelle)
W73-12627

A STUDY OF INORGANIC SALTS REQUIREMENTS AND EFFECT ON THE MORPHOLOGY OF MARINE BACTERIA,
Georgetown Univ., Washington, D.C. Dept. of Biology.
R. R. Colwell.
Available from the National Technical Information Service as AD-754 122, $3.00 in paper copy, $1.45 in microfiche. Final Report, October 15, 1972. 24 p, 86 ref. Task No NR 306-667. Contract No N00014-69-A-0220-0006.

Descriptors: *Marine bacteria, *Deficient elements, *Nutrient requirements, Electron microscopy, Magnesium, Sodium, Potassium, Cations, Hydrostatic pressure, Sodium chloride, Seawater, Water sampling, Water temperature, Microbial degradation, Chesapeake Bay, Publications, Thermal stress, Estuarine environment, Classification, Systematics.
Identifiers: *Ultrastructure, *Cell morphology, Pure cultures, Substrate utilization, Psychrophilic bacteria, Numerical taxonomy, Vibrio marinus, Potassium chloride, Magnesium chloride, Heterotrophic bacteria, Hydrocarbons, Vibrio parahaemolyticus.

A review is given of studies conducted to determine the distribution of marine bacteria in coastal and deep ocean areas, ultrastructural studies of salt-requiring, psychrophilic marine bacteria subjected to temperature and salt deprivation stresses, and the molecular biology and numerical taxonomy of marine and estuarine bacteria. A previously unreported area deals with experiments designed to investigate the effects on fine structure during growth of seawater-requiring strains in media of reduced Na and Mg content. The fine structure studies demonstrated that profound and, in most cases, irreversible changes occurred in these cells under the given test conditions. Cultures grown in Mg deficient medium demonstrated markedly aberrant intra-cytoplasmic and cell envelope morphology. Structural effects resulting from growth in media of reduced ionic strength, i.e., concentration of NaCl, KC1, and/or MgC12 of 0.1 or 0.01 times that of standard seawater, were varied, depending greatly on the given strain studied. In general, without Mg, cells demonstrated walls and membranes of aberrant, 'wrinkled' appearance. Much of the effort in this aspect of the work was expended in establishing the experimental conditions and 'normal' morphology of the test strains. By varying concentrations of Na, Mg, and Ca ions, it was found that V. marinus demonstrated marked changes in cell morphology under conditions of severe ion depletion, whereas more subtle structural changes occurred under conditions of unbalance or slightly lowered concentrations of these ions (concentrations slightly lower than normally found in seawater). (Holoman-Battelle)
W73-12628

AEROMONAS-INDUCED DEATHS AMONG FISH AND REPTILES IN AN EUTROPHIC INLAND LAKE,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
E. B. Shotts, Jr., L. Martin, A. K. Prestwood, and J. L. Gaines, Jr.
J Am Vet Med Assoc. Vol 161, No 6, p 603-607. 1972. Illus.
Identifiers: *Aeromonas, Aeromonas-Shigelloides, Alligator-Mississippiensis, Eutrophic lakes, *Fish mortaility, *Florida, Inland lakes, *Reptiles mortality, Trionyx-Ferox, Turtle.

A. hydrophila and A. shigelloides were associated with mortality among fish, turtles (Trionyxferox) and alligators (Alligator mississipiensis) of Lake Apopka, Lake and Orange Counties, Florida. Factors predisposing to infection included eutrophication of the lake and low dissolved O2 content of the water.--Copyright 1973, Biological Abstracts, Inc.
W73-12633

EFFECTS OF ZECTRAN INSECTICIDE ON AQUATIC ORGANISMS IN BEAR VALLEY CREEK, IDAHO,
Idaho Cooperative Fishery Unit, Moscow.
H. R. Gibson, and D. W. Chapman.
Trans Am Fish Soc. Vol 101, No 2, p 330-344. 1972. Illus.
Identifiers: Aquatic organisms, *Idaho, *Insecticides, Insects, Salvelinus-Malma, Terrestrial, Valley, *Zectran, Bear Valley Creek.

Assessed were effects of the experimental insecticide Zectran on aquatic organisms in Bear Valley Creek, Idaho in 1966. Hayden Creek drainage, nearby and not sprayed, served as a control. There was no significant fish mortality, and no effect on growth rate and condition of age O+, 1+, 2+ and 3+ dolly varden (Salvelinus malma). Insecticide applications did not increase emigration and instream movement of fish. No effects were noted on benthic aquatic insect numbers, but more insects drifted downstream for several hours beginning about 3 hr after spraying on 7 July 1966. Adult terrestrial insects, immature Heptageneidae and Rhyacophilidae, adult Chloroperlidae, and immature and adult Phryganeidae, Limnephilidae, and Blephariceridae increased in drift samples after spraying. It is concluded that Zectran insecticide damaged aquatic organisms very little.--Copyright 1973, Biological Abstracts, Inc.
W73-12634

MORTALITY CURVES OF BLUEGILLS (LEPOMIS MACROCHIRUS RAFINESQUE) SIMULTANEOUSLY EXPOSED TO TEMPERATURE AND ZINC STRESS,
Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab.
D. T. Burton, E. L. Morgan, and J. Cairns, Jr.
Trans Am Fish Soc. Vol 101, No 3, p 435-441. 1972. Illus.
Identifiers: Acclimation, *Bluegills mortality, Lepomis-Macrochirus, Survival, *Temperature, Time, Toxicity, *Zinc.

Bluegills were exposed to a temperature Zn interaction consisting of 5 temperature regimes and 5 concentrations of Zn which were 1.0, 5.6, 10.0 and 32.0 mg Zn++/l. All of the above concentrations of Zn and a control were tested on 5 groups of fish which were acclimated to (1) 20 plus or minus 1C, (2) 30 plus or minus 1C and fish which were acclimated to 20 plus or minus 1C and were exposed to temperature increases at the following rates: (3) 1C/24 hr (4) 1C/1 hr and (5) 1.5C/10 min until a maximum of 30C was reached. A rise in temperature could reduce the survival time of bluegills exposed to lethal and sublethal concentrations of Zn. Reductions in survival time were a function of the rates at which the temperature was increased. Bluegills acclimated to 20 and 30 and then exposed to a lethal concentration of Zn (32 mg Zn++/l) at each temperature died 2.6 times faster at 30C than at 20C. Fish acclimated to 20C and exposed to a temperature increase of 1.5C/10 min died 4.8 times faster than fish maintained at 20C. A sublethal Zn concentration (5.6 mg Zn++/l) produced no mortalities in 20C acclimated bluegills in 96 hr but was toxic to fish when the temperature was increased from 20-30C at a rate of 1.5 C/10 min.--Copyright 1973, Biological Abstracts, Inc.
W73-12637

INFLUENCE OF LAND RECLAMATION AND WASTE WATER FROM PAPER MILL ON ENVIRONMENT OF 'NORI' (PORPHYRA TENERA) CULTURE FARM, (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Dept. of Agricultural Engineering.
Y. Tanaka, and H. Inoue.
Kagawa Daigaku Nogakubu Gakuzyutu Hokoku. Vol 23, No 1, p 112-117. 1971. Illus.
Identifiers: Cultivation, Culture farms, Environment, *Japan, *Land reclamation, Pollution, Porphyra-Tenera, Productivity, Reclamation, Waste, *Paper mill wastes.

The tidal current and waste water quality in the adjacent water area were investigated. The waste water discharged from drain pipe reaches the Nori culture farm. The low productivity of this farm is due mainly to pollution with the effluents, low exchange of sea water, and dense cultivation.--Copyright 1973, Biological Abstracts, Inc.
W73-12639

EFFECT OF SCHOOL WATER FLUORIDATION ON DENTAL CARIES: FINAL RESULTS IN ELK LAKE, PA., AFTER 12 YEARS,
H. S. Horowitz, S. B. Heifetz, and F. E. Law.
Identifiers: *Dental caries, Elk Lake (Penn), *Fluoridation, Lake, *Pennsylvania, Potable water.

The water supply of a rural school was fluoridated for 12 yr at a level of 5 ppm, 4.5 times the optimum level for community fluoridation in the area. On the final survey, children who attended the school continually had 39% fewer decayed, missing and filled teeth than their counterparts on the base line. Late erupting teeth (canines, premolars, and second molars) demonstrated twice as much relative caries protection as early erupting teeth (incisors and first molars). In both categories of teeth, the greatest benefits were observed on proximal surfaces, as high as 69% for late erupting teeth.--Copyright 1973, Biological Abstracts, Inc.
W73-12647

SALMONELLA CONTAMINATION OF RIVERS AND SEWAGES IN FUKUYAMA CITY, (IN JAPANESE),
Hiroshima Univ. (Japan). Faculty of Fisheries and Animal Husbandry.
H. Hashimoto, Y. Hirata, S. Harada, and T. Shimizu.
J Fac Fish Anim Husb Hiroshima Univ. Vol 10, No 2, p 153-160. 1971. Illus. (English summary).
Identifiers: Fuduyama City (Japan), *Japan, Rivers, *Salmonella, Cities, *Sewage.

Water samples (110) collected from rivers, sewage and slaughterhouses in Fukuyama city in the eastern district of Hiroshima prefecture, Japan were examined for Salmonella, from Oct. 1967 to Dec. 1968. It was found that 23.6% (13/55) of the rivers, 22.2% (8/36) of the sewages and 36.8% (7/19) of the slaughterhouse sewage were contaiminated. The percentage of contamination is smaller in Fukuyama city than that in a larger city, such as Tokyo or Osaka. Thirty-three strains of Salmonella isolated from water samples were divided into the following 11 serotypes: S. derby, S. typhimurium, S. monevideo, S. thompson, S. mikawashima, S. narashino, S. enteritidis, S. meleagridis, S. give, S. senftenberg and S. westerstede. The environmental contamination of the area is increasing gradually, since new types of Salmonella, e.g., S. westerstede, etc. never found in Hiroshima prefecture before, were isolated.--Copyright 1973, Biological Abstracts, Inc.
W73-12648

THE EFFECT OF FLOODWATER ON OYSTERS IN MOBILE BAY,
Alabama Marine Resources Lab., Dauphin Island.
E. B. May.
Proc Natl Shellfish Assoc. 62: p 67-71. 1971. Illus.
Identifiers: *Alabama (Mobile Bay), Bays, Floodwaters, *Oysters, *Salinity, Water pollution effects.

Periodically, floodwaters entering Mobile Bay, Alabama, in winter and spring can lower the salinity to such a degree that oyster populations are affected. Oysters and oyster drills are killed and oyster setting is inhibited. The effects of low salinity were studied in 1970 and 1971 by quantitatively sampling oyster reefs and examining gonadal development. Most oysters survived long periods of exposure to salinity below 3%, but high mortality occurred on reefs where salinity was approximately 1%, for about 7 wk. Large errors were found in the box count method of estimating mortality.--Copyright 1973, Biological Abstracts, Inc.
W73-12658

EFFECTS OF FERTILIZATION ON AQUATIC PLANTS, WATER AND BOTTOM SEDIMENTS,
Rohm and Haas Co., Spring House, Pa. Research Div. Labs.
J. B. Ryan, D. N. Riemer, and S. J. Toth.
Weed Sci. Vol 20, No 5, p 482-486. 1972. Illus.
Identifiers: *Algae, Aquatic plants, *Bottom sediments, Cation, Elodea-Canadensis, Exchange, *Fertilization, Myriophyllum-Spicatum, Nutrients, Organic matter, Plants, Potamogeton-Pulcher, Sediments, Water pollution effects.

A 2-yr field study was conducted to determine the effects of fertilization on elodea (Elodea canadensis Michx.), eurasian watermilfoil (Myriophyllum spicatum L.), and heartleaf pondweed (Potamogeton pulcher Tuckerm.). Plants, water, and sediment were sampled and inorganic mineral contents determined. Water concentrations of NO3, NH4, P and K increased sharply following fertilization and generally reached maximum values within 7 days after treatment. Concentrations of these nutrients decreased rapidly after reaching maximum values. In the first yr, plant growth was not increased due to fertilization while in the second yr only heartleaf pondweed produced significantly greater yields. Elodea and eurasian watermilfoil grew better in the control environment, presumably due to less competition from algae, whose growth was increased by the addition of fertilizer. At the end of the study the top 1.3 cm of bottom sediment had increased in cation exchange capacity, organic matter, total N, and available P for all treatments while the underlying sediment remained relatively unchanged. Available P was greater in the surface of the fertilized sediment than in the surface of the control sediment.--Copyright 1973, Biological Abstracts, Inc.
W73-12661

DIATOM POPULATION DYNAMICS IN A CENTRAL IOWA DRAINAGE DITCH,
Bowling Green State Univ., Ohio. Dept. of Biology.
R. L. Lowe.
Iowa State J Res. Vol 47, No 1, p 7-59. 1972. Illus.
Identifiers: *Diatoms, *Drainage ditches, Gomphonema-Angustatum, *Iowa, Nutrients, Organic matter, Pollution, Seasonality.

Fifty-two consecutive weekly diatom samples were collected in 3 central Iowa drainage ditches from artificial substrates. Several chemical and physical environmental factors were measured simultaneously. The water at the 3 collecting stations differed mainly in the amount of organic enrichment present. Macronutrients did not appear to be limiting at any time during this study. Distinct population differences between the stations appear to reflect the degree of organic pollution. Five-hundred values were identified systemically and counted from each of the weekly samples, and a total of 67,000 were counted over the course of the study. One hundred and seventy-five species and varieties distributed among 28 genera were observed from the ditches; at least 28 of these species and varieties were unreported previously from Iowa. The density of diatoms was greatest in spring and summer at all 3 stations and the greatest number observed was 4.2 x 0.000001 cells/cm2 on July 25, 1969. Diatom densities became quite low during the late fall and winter. Gomphonema angustatum appeared in the largest numbers of any diatom and reached a maximum of 2.2 x 0.000001 cells/cm2. At one point it comprised 91% of the population.--Copyright 1973, Biological Abstracts, Inc.
W73-12665

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-1

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION II, PRODUCT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-2

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION III, CHEMICAL INGREDIENT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 05G.
W73-12671-3

THE KINETICS OF MICROBIOLOGICAL MODIFICATION OF ORGANIC SUBSTANCES IN NATURAL WATERS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W73-12712

EFFECTS OF PESTICIDES IN WATER--A REPORT TO THE STATES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12752

NITRIFICATION IN SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Sciences.
R. L. Chen, D. R. Keeney, and J. G. Konrad.
J Environ Qual. Vol 1, No 2, p 151-154. 1972. Illus.
Identifiers: Lakes, *Nitrification, Organisms, Sediments, *Wisconsin, *Lake sediments.

Nitrification rates in lake sediment-water systems were investigated in the laboratory. Samples from Wisconsin eutrophic and oligotrophic hard- and soft-water lakes were incubated at 10C or 25C in the dark using nonstirred (i.e., quiescent) and stirred (magnetic stirrer) systems open to the atmosphere. Nitrate was not formed in the acid sediments from soft-water lakes. However, in calcareous sediments from hard-water lakes, nitrification proceeded readily when the systems were stirred to increase oxygen diffusion. Nitrate did not accumulate when the samples were not stirred. Experiments with N-Serve indicated that autotrophic organisms were mainly responsible for nitrification in the Lake Mendota samples. Considering the high oxygen diffusion rate required for nitrification in sediments, it is likely that this process occurs only at the sediment-water interface in oxygenated waters.--Copyright 1972, Biological Abstracts, Inc.
W73-12763

LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTORS OF FISHES FROM A SOUTH CAROLINA RESERVOIR RECEIVING THERMAL EFFLUENT,
Savannah River Ecology Lab., Aiken, S.C.
D. H. Bennett.
Prog Fish-Cult, Vol 34, No 2, p 85-87, 1972, Illus.
Identifiers: Effluents, Fish, *Length-weight ratios (Fish), Lepomis-macrochirus, Pomoxis-nigromaculatus, Reservoirs, *South Carolina, *Thermal effluents, *Bluegill, *Black crappie.

Length-weight relationships and coefficients of condition were compared for bluegill (Lepomis macrochirus) and black crappie (Pomoxis nigromaculatus) collected at the entrance of a thermal effluent into a South Carolina reservoir with those from another part of the reservoir at ambient temperatures. Black crappies from the heated station were significantly heavier and of better body condition than crappies living at ambient temperatures. Fingerling bluegills at the heated station exhibited significantly lower condition factors than those from the control stations. Thermal effluents will not necessarily alter the body condition of fishes living in receiving waters provided cooler refuge sites are available.--Copyright 1972, Biological Abstracts, Inc.
W73-12774

HYDROSTATIC PRESSURE IN RELATION TO THE SYNCHRONOUS CULTURE OF ALGAE IN OPEN AND CLOSED SYSTEMS,
Guelph Univ. (Ontario). Dept. of Botany.
H. Lue-Kim.
Int Rev Gesamten Hydrobiol. Vol 56, No 6, p 873-921. 1971.
Identifiers: *Algae, *Carbon dioxide, *Chlorella-Ellipsoidea, Cultures, *Hydrostatic pressure, Oxygen, Pressure, Synchronous cultures, Warburg effect.

Synchronous cultures of Chlorella ellipsoidea were maintained in an open system using conventional culture techniques. Under identical growing conditions but in a closed system designed to investigate hydrostatic pressure effects on synchronous algal cultures, synchronous cell division was not maintained. The most significant difference in the culture conditions between the open and the closed systems was the concentration of CO2 and O2 which remained relatively constant throughout the growth cycle in the open system, but varied continously during the cycle in the closed system. In the closed system O2 increased and CO2 decreased during the light period; in the dark the reverse was true. In order to investigate the effects of hydrostatic pressure on the physiology and morphology of algae, it was first essential to develop techniques for successful culture of algae in the closed system. Various modifications of culture conditions were made to obtain equal growth in both systems. The n number and ratios of increase in dry weight and protein were 4.0 in the open system but never more than 2.0 in the closed system. Results indicated that high O2 might be responsible for the discrepancies in the n number and ratios of increase of the other growth criteria between the open and closed systems. Photosynthetically evolved O2 in the closed system during the light period might be sufficient to cause the Warburg Effect. Possible ways of solving the problem of gas exchange in the closed system, and in overcoming the Warburg Effect were suggested. Both pressure and O2 concentration interact to influence the division of cells.--Copyright 1973, Biological Abstract, Inc.
W73-12798

BIOLOGICALLY ACTIVE COMPOUNDS IN THE AQUATIC ENVIRONMENT: THE UPTAKE AND DISTRIBUTION OF (1,1-DICHLORO-2-,2-BIS (P-CHLOROPHENYL) ETHYLENE), DDE BY CHIRONOMUS TENTANS FABRICIUS (DIPTERA: CHIRONOMIDAE),
Michigan State Univ., East Lansing. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W73-12804

HANDBOOK OF FISH DISEASES FOR VETERINARIANS AND BIOLOGISTS,
E. Amlacher.
Veb Gustav Fischer Verlag: Jena, East Germany. 1972. 2nd Ed. 378 p, Illus.
Identifiers: *Bacteria, Biologists, Book, Crabs, Diseases, *Fish diseases, Helminths, Pathology, Protozoans, Veterinarians, *Viruses (Fish).

Important data are presented on diseases of inland fish, including etiology, pathogenesis, epidemiology, pathological histology, histochemistry, therapy and prophylaxis. These diseases include viruses, bacterioses, mycoses, protozoonoses, helminthoses and those caused by dinoflagellates and parasitic crabs. Environmental factors are also covered. Examination techniques for each disease group and methods for shipping are discussed. A diagnostic chart lists symptoms, diseases and control measures. A subject index and bibliography are included.--Copyright 1973, Biological Abstracts, Inc.
W73-12813

METABOLIC EFFECTS OF PCB (POLYCHLORINATED BIPHENYLS) ON THE BROWN TROUT (SALMO TRUTTA),
Salmon Research Inst., Alvkarleo (Sweden).
N. Johansson, A. Larsson, and K. Lewander.
Comp Gen Pharmacol. Vol 3, No 11, p 310-314, 1972.
Identifiers: Anemia, *Brown trout, Cholesterol, Enlargement, Glycemia, Glycerides, Hyper, Liver, Salmo-trutta, *Trout (Metabolism), *Polychlorinated biphenyls.

Brown trout were given a total of 10 microgram PCB/g body-weight. The effects on different metabolites in blood, liver, and muscle were studied after 43 and 203 days. During the first 43 days the fish were fed. On day 43 the PCB-treated trout showed blood anemia, hyperglycemia, enlargement of the liver, and altered cholesterol metabolism. Between 43 and 203 days the fish were subjected to 4 mo. starvation followed by a refeeding period. On day 203 the PCB-treated trout showed higher body-weights, lower muscle glycogen levels, and a more pronounced decrease in liver triglycerides.--Copyright 1973, Biological Abstracts, Inc.
W73-12819

MERCURY IN FISH: SOME TOXICOLOGICAL CONSIDERATIONS,
University Hospital, Lund (Sweden). Dept. of Occupational Medicine.
S. Skerfving.
Food Cosmet Toxicol. Vol 10, No 4, p 545-556, 1972, Illus.
Identifiers: Aniamls, *Fish, Humans, *Mercury, Reviews (Literature), *Toxicological studies.

A literature review including animal experiments, metabolism of methylmercury and toxicity levels in man, and actions by various governments is presented.--Copyright 1973, Biological Abstracts, Inc.
W73-12826

DDT RESIDUES IN WHITE CROAKERS,
California State Dept. of Fish and Game, Sacramento.
W. T. Castle, and L. A. Woods, Jr.
Calif Fish Game. Vol 58, No 3, p 198-203. 1972.
Identifiers: Croakers, *DDT residues, Genyonemus-Lineatus, *White croakers.

The level of DDT residues in white croaker (Genyonemus lineatus) flesh (group A) and flesh with the skin left on (group B) was determined by gas liquid chromatography. The percent fat in group A and group B also was determined. There were significant differences ($P < .01$) between levels of DDT and between the percent fat in the 2 groups. The fat determined for group A was 3.76% (SE ± 0.37%) and for group B was 6.06% (SE ± 0.48%). The total DDT residue (including pp'DDT, its metabolites and isomers) for group A was 10.82 ppm (SE ± 0.96 ppm) and group B was 18.23 ppm (SE ± 1.95 ppm). The only residues detected at the limit of detection of 0.01 ppm were 1,1-dichloro-2-(o-chlorophenyl)-2- (p-chlorophenyl)ethane, (op'DDE); 1,1,1-trichloro-2- (o-chlorophenyl-2-(p-chlorophenyl)ethane, (op'DDT);1,1-dichloro-

2,2-bis (p-chlorophenyl)ethane, (pp'DDD); and 1,1,1-trichloroy2,2-bis (p-chlorophenyl)ethane, (pp'DDT). Many of the samples analyzed exceeded USA Food and Drug administration guideline tolerance of 5.0 ppm wet weight for total DDT.—Copyright 1973, Biological Abstracts, Inc.
W73-12835

THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. R. Keeney.
Journal of Environmental Quality, Vol 2, No 1, p 15-29, January-March 1973. 6 fig, 6 tab, 188 ref.

Descriptors: *Reviews, *Aquatic productivity, *Sediment-water interfaces, *Nitrogen cycle, Euthrophication, Environmental effects, Cycling nutrient, Nitrification, Dentrification, Nitrogen fixation, Water quality, Ecosystems, Algae, Bacteria, Biomass, Nitrogen, Sediments, Water temperature, Cyanophyta, Anabaena, Aquatic soils, Mineralogy, Soil properties, Lake morphology, Hydrogen ion concentration, Dissolved oxygen, Oxidation-reduction potential, Nutrients, Lakes, Electrodes, Respiration, Bacteria, Plankton, Incubation, Pseudomonas.
Identifiers: Mineralization, Immobilization, Ammonification, Nutrient interchange, Fate of pollutants, Anerobic respiration, N-15, Lake Mendota, Bantam Lake, Green Lake, Lake Kinneret, Nitrobacter, Bacillus, Achromobacter, Micrococcus, Nitrosomonas europea, Clostridium pasteurinnum.

The available literature on the fate of nitrogen in waters and sediments is reviewed. Emphasis is placed on the importance of N to aquatic productivity, the pathways leading to N gains or losses in aquatic ecosystems, and the availability of N in sediments to the overlying waters. Important biological reactions include N mineralization and immobilization, nitrification and denitrification, and N fixation. The effect of sediment properties, lake morphology and environmental factors)pH, temperature, dissolved oxygen, oxidation-reduction) on the pathways and rates of N turnover are considered. The mixing process in sediments appear to be the most important in releasing sediment-N to waters. Several facets of the N cycle in waters and sediments require further elucidation. Research needs are outlined. (Mortland-Battelle)
W73-12843

PHYSIOLOGY AND CYTOLOGICAL CHEMISTRY OF BLUE-GREEN ALGAE,
MSU/AEC Plant Research Lab., East Lansing, Mich.
C. P. Wolk.
Bacteriological Reviews, Vol 37, No 1, p 32-101, March 1973. 16 fig, 2 tab, 839 ref.

Descriptors: *Plant physiology, *Reviews, *Cyanophyta, *Algae, *Cytological studies, *Photosynthesis, *Respiration, *Plant morphology, Nitrogen fixation, Genetics, Plant pigments, Lipids, Metabolism, Algal toxins, Nutrient requirements, Nitrogen compounds, Carbon, Sulfur, Reduction (Chemical), Nitrates, Nitrites, Ammonia, Amino acids, Plant viruses, Rhodophyta, Enzymes, Trace elements, Carbon dioxide, Organic compounds, Light, Temperature.
Identifiers: *Algal growth, Biochemical properties, Cyanophages, Ultrastructure, Biosynthesis, Substrate utilization, Synchronous cultures, Pure cultures, Culturing techniques, Electron transport, Acetates, Nucleic acids.

That information which is pertinent to the study of the developmental phenomena of blue-green algae has been expanded to encompass that which is know of their physiology and cytological chemistry. This review covers the latter two areas of interest. (Holoman-Battelle)
W73-12845

CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
P. C. Kerr, D. L. Brockway, D. F. Paris, and S. E. Craven.
Journal of Environmental Quality, Vol 2, No 1, p 46-52, January/March 1973. 1 fig. 72 ref.

Descriptors: *Reviews, *Carbon cycle, *Aquatic environment, *Sediment-water interfaces, *Aquatic microorganisms, Carbon dioxide, Sinks, Ecoystems, Adsorption, Sediments, Anaerobic bacteria, Aerobic bacteria, Algae, Aquatic productivity, Cycling nutrients, Aerobic conditions, Anaerobic conditons, Biodegradation, Path of pollutants, Secondary productivity, Carbon, Nutrients, Organic matter, Nitrogen, Phosphorus, Sorption, Clay minerals, Fungi, Yeasts, Phosphates, Carbonates, Primary productivity, Hydrogen ion concentration, Methane, Photosynthesis, Benthos, E. coli, Bioindicators, Degradation (Decomposition), Organic acids, Sedimentation, Metabolism, Bicarbonates, Bottom sediments.
Identifiers: Nutrient interchange, Mineralization, Heterotrophy, Organic carbon, Substrate utilization, Autotrophic nutrition, Heterotrophic nutrition.

Literature relevant to the extent and rate of carbon exchange between sediment and water is reviewed and the general implication of the role of carbon in regulating biological activity is discussed. Several conclusions are drawn from the review. The extent of adsorption of organics to clay minerals in natural aquatic ecosystems is not known. Sorption, desorption, sedimentation, and aerobic and anaerobic activity are affected by physical factors such as depth and mixing. Certain data indicate that organisms cannot utilize organic material sorbed to clay minerals; other data indicate that growth of certain bacteria and yest is stimulated by the addition of clay minerals. Although the exact substrate (s) is not known, aerobic and anaerobic decomposition of organic materials occurs in and on sediments. Aerobic decomposition seems to result in three different reactions affecting sediment-water carbon exchange: (1) Methane gas is produced and released from sediments. (2) Organic acids produced by anaerobes can serve as carbon sources for aerobes as well as aiding in solubilization of carbonates and affecting sorptive processes. (3) Carbon dioxide produced by anaerobes may be combined in some manner and remain in the sediments. The fact that most deep sediments retain organic carbon indicates that sediments may be sinks for organics. Possibly sediments serve as organic carbon sinks simply because the rate of sedimentation exceeds the rate of decomposition. (Mortland-Battelle)
W73-12846

FLOW OF MICROBIALLY FIXED NITROGEN IN A MODEL ECOSYSTEM,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W73-12847

A COMPARISON OF LIQUID SCINTILLATION AND GEIGER-MULLER ESTIMATES OF PRIMARY PRODUCTIVITY IN AN IN SITU EXPERIMENT,
Manitoba Univ., Winnipeg. Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-12848

COMMUNITY STRUCTURE OF THE BENTHOS IN SCOTTISH SEA-LOCHS. II. SPATIAL PATTERN,
Dunstaffnage Marine Research Lab., Oban (Scotland).
J. Gage, and A. D. Geekie.
Marine Biology, Vol 19, No 1, p 41-53, March 1973. 6 fig, 5 tab, 23 ref.

Descriptors: *Spatial distribution, *Benthos, *Biological communities, *Benthic fauna, *Distribution patterns, Statistical methods, Environmental effects, Brackish water, Water sampling, Nematodes, Oligochaetes, Annelids, Copepods, Invertebrates, Data processing.
Identifiers: Data interpretation, *Macroinvertebrates, Epifauna, Infauna, Peloscolex benedeni, Aristias neglectus, Nereimyra punctata, Fabriciola baltica, Polydora quadrilabata, Thyasira flexuosa, Calanus finmarchicus, Aricidea catherinae, Terebellides stroemi, Paraonis lyra, Arcturella dilatata, Prionospio malmgreni, Sphaerosyllis bulbosa, Diplocirrus glaucus, Parvicardium ovale, Capitomastus minimus, Melinna palmata, Pholoe minuta, Prionospio cirrifera, Pherusa plumosa, Scalibregma inflatum, Paraonis gracilis, Spriorbis, *Loch Etive (Scotland), *Loch Creran (Scotland).

Spatial pattern in the distribution of the macrobenthos was studied from series of van Veen grab samples taken in a systematic pattern in Lochs Etive and Creran, W. Scotland. Each series was collected in a circular pattern at 7 stations. Plots of the variances of the numerical occurrences of the species in the samples against their means revealed greater deviation from the random expectation in the case of the 2 muddy sand stations than for the soft-mud stations, with only 1 exception. Two tests of goodness-of-fit to the Poisson distribution were also applied. The degree of concordance between the 3 measures of nonrandomness applied was measured. The best correlation was found between values of the ratio of variance: mean and the test statistic D of the Kolmogorov-Smirnov goodness-of-fit test. It was not possible to discuss the biological basis for the pattern measured, except for a few species shown to be markedly aggregated. No clear trend emerged from attempts to detect differences in pattern with various ecological groupings of the macrobenthos. However, from the use of the test values as sample statistics illustrative of overall community pattern, it was possible to conclude that the fauna of the shallow, usually current-swept areas of muddy sand in the sea-lochs investigated was more aggregated than that on the usually deeper, soft-mud sediments in quieter water. (See also W73-08431) (Holoman-Battelle)
W73-12855

UPTAKE OF MERCURY BY CAGED RAINBOW TROUT (SALMO GAIRDNERI) IN THE SOUTH SASKATCHEWAN RIVER,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. F. Uthe, F. M. Atton, and L. M. Royer.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 643-650, May 1973. 1 fig, 4 tab, 10 ref.

Descriptors: *Mercury, *Absorption, *Rainbow trout, Water pollution effects, *On-site tests, *Canada, Bioindicators, Chemical analysis, Heavy metals.
Identifiers: *Biomonitoring, Methylmercury, Liver, Kidneys, Sample preservation, Atomic absorption spectrophotometry, Animal tissues, Salmo gairdneri, *South Saskatchewan River, Diefenbaker Lake, Pike Lake, Tobin Lake.

Rainbow trout were held in cages in the South Saskatchewan River to assess mercury uptake following curtailment of mercury discharges to the river. Six fish were taken from the cages at random at 2-week intervals and pooled homogenate samples were taken from the livers, kidneys, and headless, dressed carcasses. The total mercury content of samples was determined by flameless atomic absorption spectroscopy. There was a rapid uptake of mercury by the fish during the first warm summer period (1970) with mnutrients uch less uptake during the rest of the year. A second summer experiment (1971) produced no significantly different results suggesting that a long-term contamination exists within this river system. Analyses showed that the bulk of mercury present

in the fish carcasses was present as methylmercury. It was concluded that caged fish are good monitors of mercury pollution. The studies also showed that the cessation of mercury discharge into a river does not lead to elimination of mercury uptake in fish. (Mortland-Battelle)
W73-12857

SOME SHORT-TERM INDICATORS OF SUBLETHAL EFFECTS OF COPPER ON BROOK TROUT, SALVELINUS FONTINALIS,
National Water Quality Lab., Duluth, Minn.
R. A. Drummond, W. A. Spoor, and G. F. Olson.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 698-701, May 1973. 2 tab, 8 ref.

Descriptors: *Copper, *Toxicity, *Brook trout, *Fish behavior, *Bioindicators, *Laboratory tests, Water pollution effects, Monitoring, Lethal limit, Food habits, Bioassay.
Identifiers: *Pollutant effects, Cough frequency, Locomotor activity, Salvelinus fontinalis.

Laboratory tests were conducted to evaluate changes in cough frequency, locomotor activity, and feeding behavior as possible short-term indicators of the long-term effects of copper on brook trout. The trout were studied in plastic electrode chambers that allowed free movement in continuously flowing water. The electrodes measured respiratory and other movements, which were recorded on a polygraph. The effect of copper on coughing was measured by comparing cough frequency during a 24-hour exposure to that during the preceding 24-hour period. The effect on locomotor activity was measured during the first 2 hours of exposure and compared with activity the day before the test and with that of controls. Feeding behavior was monitored at 2 and 24 hours after exposure began and any departure from normal aggressive feeding patterns was recorded. Changes occurred in all three activities at copper concentrations near 9.5 micrograms/1. Each response thus showed promise as a short-term indicator of the concentration range at which chronic exposure might have no permanent effect. Cough frequency was the best of the three for showing stress acccording to the copper concentration, but the change developed more slowly than in locomotor activity. (Mortland-Battelle)
W73-12859

NITROGEN RELEASE FROM LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05B.
W73-12860

IDENTIFICATION OF THE LIMITING NUTRIENT AND SPECIFIC GROWTH RATE,
Ohio State Univ., Columbus.
R. M. Sykes.
Journal Water Pollution Control Federation, Vol 45, No 5, p 888-895, May 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Cultures, *Mathematical models, *Growth rates, *Microorganisms, *Limiting factors, *Essential nutrients, *Theoretical analysis, Kinetics, Nutrient requirements.
Identifiers: Chemostat, Batch cultures, Continuous cultures, Culture media, Monod model.

The simplest mathematical theory of continuous microbial cultures, that for the chemostat, contains the corollary that a given growth medium may contain more than one limiting nutrient. If it does, in chemostat cultures each nutrient is limiting in a different, nonoverlapping dilution rate range, and in batch cultures each nutrient limits in different growth stages. It is possible to derive from the differential equations describing the microbial culture both the conditions permitting multiple limiting nutrients and the boundaries of each nutrient's range of limitation. These deductions are a consequence of defining the limiting nutrient as the nutrient that controls the organism's specific growth rate. Deductions can be derived for any model of microbial culture. (Mortland-Battelle)
W73-12861

BENTHIC INVERTEBRATES IN LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka.
Am Midland Nat. Vol 88, No 2, p 408-418, 1972.
Identifiers: *Benthic invertebrates, Lakes, *North Dakota (Lake Ashtabula), Reservoirs, *Eutrophic lakes.

The kinds and amounts of benthic invertebrates in Lake Ashtabula, a 20-yr-old eutrophic reservoir in southeastern North Dakota, were recorded at a single station located 3.2 km N of the dam. The average standing crops of benthic invertebrates in the sampling station collected during April, June and Aug. 1967 were 6.4, 8.2 and 7.1 g m-2, respectively, and 1831, 2622 and 1295 individuals m-2. Organisms in the 0-3 m depth zone accounted for 28% by number and 53% by weight of all organisms present in the study area from April to Aug; 56% by number and 37% by weight were in the 3-8 m depth zone; and 16% by number and 9% by weight were in the 8-12 m depth zone. The quantity and kinds of its benthic invertebrates indicate Lake Ashtabula is eutrophic when compared with data available from other lakes that are also unstratified during open-water periods.--Copyright 1973, Biological Abstracts, Inc.
W73-12863

SOME EFFECTS OF EVAPORATION SUPPRESSION ON RESERVOIR ECOLOGY,
North Texas State Univ., Denton. Dept. of Biological Sciences.
J. K. G. Silvey, H. B. Sharp, K. L. Dickson, R. C. Allison, and J. C. Stiles.
Journal of the American Water Works Association, Vol 65, No 4, p 260-268, April 1973. 12 fig, 4 tab, 24 ref.

Descriptors: *Aquatic algae, *Aquatic insects, *Reservoirs, *Evaporation control, *Hexadecanol, *Water quality, Aquatic bacteria, *Annelids, *Benthos, Aquatic fungi, Freshwater fish, Monomolecular films, Midges, Color, Specific conductivity, Pseudomonas, Diptera, Water sampling, Turbidity, Tubificids, Phosphates, Nitrates, Conductivity, Hydrogen ion concentration, Carbonates, Bicarbonates, Sulfates, Chlorides, Dissolved oxygen, Carbon dioxide, Pyrrophyta, Iron, Cultures, Gas chromatography, Water temperature, Dinoflagellates, Surface tension, Calcium, Hardness (Water), Chlorophyta, Cyanophyta, Chrysophyta, Mayflies, *Oklahoma.
Identifiers: Standard methods, Bacillus, Macroinvertebrates, *Lake Hefner (Okla), Kids Lake, Actinomycetes, Alcaligenes, Flavobacterium, Brevibacterium, Hexagenia.

Studies were made in Lake Hefner, an Oklahoma City water supply reservoir, to determine the effects of hexadecanol on biological, chemical, and physical aspects of water quality. Hexadecanol is a chemical applied to suppress evaporation. Samples were taken twice a week from five stations during summer months and analyzed for bacteria, algae, phosphates, and nitrates. Chemical and physical analyses for hardness, temperature, specific conductance, pH, carbonates, bicarbonates, sulfates, chlorides, DO, CO2, iron, color and turbidity were performed weekly. During winter months, monthly samples were analyzed in a like manner. The study was conducted over a 5-year period. The application of hexadecanol apparently had no detectable deleterious effect on chemical water quality. Some stimulation in the population of certain bacterial organisms could be seen, but only when a composite was made of all data from each station. A slight correlation could also be made between laboratory studies and the organisms shown to be stimulated in the reservoir. But since other conditions may have had an effect, it was not possible to conclude that population increases were due entirely to hexadecanol. There was no apparent difference in bottom fauna between periods of coverage and non-coverage. It was concluded that hexadecanol in the concentrations used had no detectable effect on the ecology of the reservoir. (Mortland-Battelle)
W73-12869

STREAM-VELOCITY EFFECTS ON THE HEAVY-METAL CONCENTRATIONS,
Alabama Univ., University. Dept. of Biology.
For primary bibliographic entry see Field 05B.
W73-12870

PHYSIOLOGICAL CHANGES IN MYTILUS EDULIS L. INDUCED BY TEMPERATURE AND NUTRITIVE STRESS,
Leicester Univ. (England). Dept. of Zoology.
B. L. Bayne.
Journal of the Marine Biological Association of the United Kingdom, Vol 53, No 1, p 39-58, February 1973. 9 fig, 7 tab, 27 ref.

Descriptors: *Thermal stress, *Animal physiology, *Laboratory tests, *Physiological ecology, *Environmental effects, Nitrogen, Animal metabolism, Water temperature, Mussels, Mollusks, Invertebrates, Water pollution effects, Ammonia, Bioassay, Proteins, Carbohydrates, Lipids, Summer, Autumn, Winter.
Identifiers: *Nutritive stress, Seasonal variation, Oxygen consumption, Excretion, Blood, Metabolites, Sugars, alpha-Amino nitrogen, Macroinvertebrates.

The results of the determination of oxygen consumption, nitrogen excretion (both as ammonia-N and alpha-amino-N) and of the concentration of blood metabolites in Mytilus edulis are described in relation to seasonal cycle and to changes induced by temperature and nutritive stress in the laboratory. Four routine stress experiments were set up using 100 animals of uniform length per experiment in aquaria with re-circulating seawater. Three levels of oxygen consumption rate were identified, viz. standard, routine and active. Animals fed above the maintenance energy requirement adjust their oxygen consumption rate to a routine level. Animals fed below the maintenance requirement reduce their oxygen consumption rate to a standard level within 35-40 days. The routine rate is seasonally variable, with high values in the winter and low values in the summer. The standard rate also varies seasonally. The exponent that relates oxygen consumption to body size varies from a high value in the summer to a lower value in the winter. Rates of excretion of ammonia-N and alpha-amino-N vary seasonally from high values in winter to low values in summer. Significant amounts of alpha-amino-N are lost from the body at all times, and especially during stress. In unstressed animals the atomic ratio of oxygen consumed to ammonia-N excreted remains at about 100 for most of the year, but rises to much higher values in the summer. The relationship observed in the ON values under stress suggests that the O:N ratio is a sensitive index of nutritive stress in Mytilus. Changes in blood sugars were interpreted in terms of an index of blood sugar energy reserve, which varies with stress. Temperature and nutritive stress is seen to alter seasonal steady-state values of physiological indices. New steady states are established as a result of stress, and the measured shifts in these indices provide estimates of the physiological effects of environmental change. (Holoman-Battelle)
W73-12878

THE MECHANISMS OF NITROGEN ASSIMILATION IN PSEUDOMONADS,
Newcastle-upon-Tyne Univ. (England). Dept. of Microbiology.
C. M. Brown, D. S. Macdonald-Brown, and S. O. Stanley.
Antonie van Leeuwenhoek, Vol 39, No 1, p 89-98, 1973. 4 fig, 2 tab, 17 ref.

Descriptors: *Nitrogen, *Aerobic bacteria, *Cultures, *Enzymes, Nitrates, Nutrient requirements, Deficient elements, Environmental effects, Marine bacteria, Path of pollutants, Ammonia, Temperature, Hydrogen ion concentration, Assay.
Identifiers: *Assimilation, *Pseudomonads, *Substrate utilization, Enzymatic activity, Pseudomonas aeruginosa, Pseudomonas fluorescens, Chemostat, NAD, NADP, Glutamine synthetase, Glutamate dehydrogenase, Psychrophilic bacteria, L-glutamine: 2-oxoglutarate aminotransferase, Culture media, Glutamate, Fate of pollutants.

Pseudomonas aeruginosa, Ps. fluorescens and 3 marine psychrophylic pseudomonads were grown in chemostat cultures with nitrate ammonia or glutamate as nitrogen source. In cultures grown on nitrate (either carbon- or nitrogen-limited) and in ammonia nitrogen-limited cultures ammonia was assimilated via the glutamine synthetase/L-glutamine: 2-oxoglutarate aminotransferase (GS/GOGAT) pathway. With an excess of ammonia in the culture however ammonia was assimilated via glutamate dehydrogenase (GDH), and glutamine synthetase (GS) was either present only at low levels or absent. Two distinct GDH activities were detected in all 5 bacteria, one specific to NAD and one to NADP. The presence of these activities was determined by the environment in which cells were grown. These activities showed differences with respect to substrate affinity (Km values) for ammonia, incubation temperature and to a lesser extent pH and may involve separate GDH isoenzymes. GS from the marine bacterium PL sub 1 had a very high affinity for ammonia (Km of 0.3 mM) but a low affinity for glutamate (Km of 9 mM). (Holoman-Battelle)
W73-12881

THE UTILIZATION OF LEAF LITTER BY STREAM DETRITIVORES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins, R. C. Petersen, F. O. Howard, J. C. Wuycheck, and V. I. Holt.
Ecology, Vol 54, No 2, p 336-345, Early Spring 1973. 3 fig, 9 tab, 27 ref.

Descriptors: Animal growth, *Mortality, Aquatic insects, *Laboratory tests, Natural streams, *Secondary productivity, Hickory trees, Caddisflies, Stoneflies, Immature growth stage, Mayflies, Standing crops, Aquatic fungi, Diptera, Larvae, Growth rates, Decomposing organic matter.
Identifiers: *Detritivores, *Leaf litter, *Heterotrophic nutrition, Dissolved organic matter, Particulate organic matter, Flies, Species density, Food conversion, Carya glabra, Pignut hickory, Lunulospora curvula, Crane flies, Tipula abdominalis, Tipula caloptera, Pycnopsyche lepida, Pycnopsyche guttifer, Pycnopsyche scabripennis, Pteronarcys pictetii, Stenonema fuscum, Stenonema tripunctatum, Stenonema interpunctatum, Stenonema canadense, Substrate utilization, Stenonema spp, Tipula spp, Pycnopsyche luculenta, Pteronarcys scotti, Stenonema pulchellum, Neiophylax concinnus.

Investigations of large and fine particle feeding detritivores (shredders and collectors) fed on conditioned hickory leaves (Carya glabra) revealed density-dependent intra- and interspecific interactions. Shredder (Tipula and Pycnopsyche) growth rates ranged from 0.47 to 1.53 percent increase in body wt/day depending upon density, species combinations, and culture temperature. Collector (Stenonema) growth rate ranged from 0.13 to 1.80 percent body wt/day, being greatest at high densities, particularly in combination with shredders. Food consumption ranged from 15.7 to 33.2 percent body wt/day for shredders and 4.0 to 23.2 percent body wt/day for collectors. After non-shredder feeding losses are accounted for, estimated shredder standing crop required to account for processing of reported leaf litter inputs compare generally to measured shredder standing crop. (Holoman-Battelle)
W73-12882

DISPERSION, DISPERSAL, AND PERSISTENCE OF THE ANNUAL INTERTIDAL ALGA, POSTELSIA PALMEFORMIS RUPRECHT,
Scripps Institution of Oceanography, La Jolla, Calif.
P. K. Dayton.
Ecology, Vol 54, No 2, p 433-438, Early Spring 1973. 3 fig, 1 tab, 9 ref.

Descriptors: *Phaeophyta, *Intertidal areas, *Ecological distribution, *Persistence, Dispersion, Marine algae, Competition, Succession, Crustaceans, Biological communities, *Washington, Mussels, Invertebrates, Annual, Distribution patterns.
Identifiers: *Postelsia palmaeformis, *Colonization, Mytilus californianus, Species interaction, Chthamalus dalli, Balanus glandula, Balanus cariosus, Pollicipes polymerus, Gooseneck barnacle, Acorn barnacle, Macroinvertebrates.

Postelsia palmaeformis is an annual brown alga that occurs on the Washington coast at upper intertidal sites subjected to extreme wave exposure. The alga occurs in patches within beds of Mytilus californianus, the competitive dominant in this region. Postelsia sporophytes are shown to colonize experimentally cleared spaces in beds of Mytilus with no concurrent colonization of adjacent uncleared controls. However, unlike many annual algae which have high spore dispersal abilities, Postelsia seems to have an effective distance of sporophyte colonization also. Postelsia patches are maintained through time by settlement of Postelsia on other algal and animal species. By increasing the probability of both being ripped from the substratum, and by overgrowing and smothering barnacles, Postelsia sporophytes clear primary substratum for the eventual use of sporophytes of their own species. (Holoman-Battelle)
W73-12883

THE USE OF FISH AS SENSORS IN INDUSTRIAL WASTE LINES TO PREVENT FISH KILLS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., R. E. Sparks, and W. T. Waller.
Hydrobiologia, Vol 41, No 2, p 151-167, March 29, 1973. 5 fig, 7 tab, 10 ref.

Descriptors: *Industrial wastes, *Toxicity, *On-site data collections, *Water pollution effects, *Methodology, Movement, Bioindicators, Automatic control, Effluents, Water pollution control, Fish populations, Sunfishes, Fishkill, Water pollution, Zinc, Freshwater fish, Data collections, Sampling, Industrial plants, Water quality control.
Identifiers: *Bluegills, *Biomonitoring, Breathing, Minicomputers, Continuous flow system, Lepomis macrochirus, Data interpretation.

The use of movements and breathing rates of bluegill sunfish as in the detection of sublethal concentrations of zinc can be applied to industrial waste lines. Fish movement patterns and breathing rates would be monitored according to methods described in previous papers. Since industrial waste and water qualities are apt to vary unpredictably, a redundant detection system is desirable. If that monitoring system were automated the rate of data acequisition and analysis could be greatly speeded up. At an actual industrial site, a monitoring unit would be located on each waste stream in the plant and on the combined waste stream. The experimental fish in each unit would be exposed to waste diluted with water from the river above the plant, and control fish would be exposed to upstream water alone. The information from each monitoring unit could be analyzed by a central data processor, and when there was a warning response, the industry could tell which waste stream wa s at fault. If the problem was outside the plant, the control fish would show responses. It is likely that 'fish sensors' in continuous monitoring units at industrial sites can warn of developing toxic conditions in time to forestall acute damage to the fish populations in streams. (Holoman-Battelle)
W73-12889

ARTIFICIAL RESERVOIR DESTRATIFICATION EFFECTS ON PHYTOPLANKTON,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Forestry and Wildlife Science.
R. T. Lackey.
Journal Water Pollution Control Federation, Vol 45, No 4, p 668-673, April 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Phytoplankton, *Reservoirs, *Environmental effects, *Aeration, Chlorophyta, Cyanophyta, Sampling, Pyrrophyta, Aquatic algae, Diatoms, Chlorophyta, Distribution patterns, Plant populations, Dinoflagellates.
Identifiers: *Thermal destratification, Vertical distribution, Sample preservation, Volvox, Mallomonas, Seasonal variation, Eudorina elegans, Sphaerozosoma aubertianum, Staurastrum gracile, Ceratium hirundinella, Asterionella formosa, Fragilaria crotonensis, Melosira granulata, Anabaena flos-aquae, Aphanizomenon flos-aquae, Gomphosphaeria lacustris.

A 19-ha Colorado montane reservoir was kept thermally destratified by continuous aeration for 1 yr. Samples were taken on a single day near the middle of each month from five permanently marked stations and consisted of four 3-liter hauls taken at each 0.5-m depth within each 2-m stratum. Samples were strained through a 75-mm mesh net, preserved in 4 percent formaldehyde, and enumerated in Palmer counting cells. Individual plankters were enumerated where practical, but colonies and chains were also treated as individuals. Statistical methods were used in analyzing the results. Total phytoplankton abundance was reduced, but phyla varied in their response. Green phytoplankton (Chlorophyta) decreased in abundance and diatoms (Bacillariophyceae) were nearly eliminated during destratification. Blue-green algae (Cyanophyta), however, increased in abundance and this phenomenon may limit the use of destratification in water management. Vertical distribution of phytoplankton was not affected by destratification. (Mortland-Battelle)
W73-12895

EFFECT OF INCUBATION TEMPERATURE ON THE MACROMOLECULAR AND LIPID CONTENT OF THE PHYTOFLAGELLATE OCHROMONAS DANICA,
Queens Coll., Flushing, N.Y. Dept. of Biology.
S. Aaronson.
Journal of Phycology, Vol 9, No 1, p 111-113, March 1973. 4 tab, 17 ref.

Descriptors: *Cytological studies, *Thermal stress, *Environmental effects, Proteins, Lipids, Aquatic algae, Carbohydrates, Biomass, Thermal pollution, Cultures, Incubation, Water pollution effects, Growth rates, Chlorella, Eutrophication, Food chains, Degradation (Decomposition), Temperature, Chrysophyta.
Identifiers: *Ochromonas danica, *Chemical composition, RNA, Culture media.

Ochromonas danica grown in a chemically defined medium under controlled conditions at different incubation temperatures showed marked changes in chemical composition and secretory pattern. As the incubation temperature rose from 15 to 30C, the cell number per unit volume of medium increased; the cell mass reach a maximum and then declined slightly, and the weight per single cell decreased. The chemical composition of the cells changed with increasing temperature: carbohydrates decreased dramatically; proteins quadrupled at 20C and then declined 25 percent; lipids increased to about 40 percent of maximum at 30C. The extracellular secretion by the cells of carbohydrates seemed to increase and then decline; RNA decreased; proteins increased; and lipids remained approximately constant, as the temperature increased. Increased oxygen utilization in the decay process that may result from these changes and lower oxygen solubility in warmer waters may well enhance the eutrophication process already rampant in much of the aquatic environment. On the other hand, knowledge of the ecological changes produced by thermal pollution at the primary food chain level may permit the exploitation of this pollutant for aquaculture. (Moreland-Battelle)
W73-12896

SWIMMING PERFORMANCE OF YOUNG ATLANTIC SALMON (SALMO SALAR) AS AFFECTED BY REDUCED AMBIENT OXYGEN CONCENTRATION,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
M. N. Kutty, and R. L. Saunders.
Journal of the Fisheries Research Board of Canada, Vol 30, No 2, p 223-227, February 1973. 3 fig, 14 ref.

Descriptors: *Atlantic salmon, *Oxygen sag, *Fish behavior, *Swimming, *Juvenile fish, *Laboratory tests, *Water pollution effects, Dissolved oxygen, Bioassay, Smolt, Tilapia, Cechlids, Rainbow trout, Freshwater fish, Fish physiology, Water quality standards, Oxygen requirements, Cold-water fish.
Identifiers: Salmo salar, Salmo gairdneri, Carassius auratus, Goldfish.

As oxygen concentraion is lowered, a point is reached, the critical oxygen level, at which juvenile Atlantic salmon (salmo salar) stop swimming in a tunnel respirometer. At concentrations just above the critical level, salmon frequently lose position in the upstream end of the respirometer and fall back to the downstream end while still headed into the current. There appears to be a progressive decrease in locomotor activity, indicated by reduced tailbeat frequency, on approaching the critical concentration. Swimming performance of the Atlantic salmon is more highly dependent on oxygen concentration than is that of rainbow trout (Salmo gairdneri), goldfish (Carassius auratus), or Tilapia. The critical oxygen level for salmon swimming at 55 cm/sec is about 4.5 mg/liter, in comparison with 2.0 for rainbow trout, 1.7 for goldfish, and 1.0for Tilapia. Between the minimum speed at which a salmon swims steadily and the maximum of which the fish is capable, the critical oxygen level rises with increase in swimming speed. Stoppage of swimming at the critical level is not owing to fatigue; fish resume swimming within minutes of the oxygen level being raised only slightly. The high critical oxygen levels for salmon in relation to other species including rainbow trout, another salmonid, point up the need for maintenance of stringent water quality criteria for oxygen levels in salmon rivers. (Holoman-Battelle)
W73-12897

A RELATIONSHIP BETWEEN HETEROTROPHIC UTILIZATION OF ORGANIC ACIDS AND BACTERIAL POPULATIONS IN WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Botany.
G. G. C. Robinson, L. L. Hendzel, and D. C. Gillespie.
Limnology and Oceanography, Vol 18, No 2, p 264-269, March 1973. 2 fig, 2 tab, 15 ref.

Descriptors: *Organic acids, *Aquatic bacteria, Adsorption, Organic compounds, Water sampling, Cultures, *Canada.
Identifiers: *Substrate utilization, *Heterotrophic nutrition, *Heterotrophic bacteria, Bacterial populations, *Blue Lake (Manitoba), Data interpretation, Plate counts, Lactic acid, Pyruvic acid, Fumaric acid, Malic acid, Acetic acid, Succinic acid, Glycolic acid, Citric acid, Formic acid, Sample preparation, Cytophaga.

The relationship between the concentration of nine organic acid substrates (lactic, pyruvic, fumaric, malic, acetic, succinic, glycolic, citric, and formic) and their velocities of uptake have been investigated in West Blue Lake, Manitoba. Maximum uptake velocities were ranked and compared with bacterial plate counts on minimal media supplemented with single organic acids. Water samples from a 5-m depth were screened through a 153-micron Nitex screen to remove most of the zooplankton. Subsamples were place in an appropriate number of sterile 25-ml bottles and inoculated with the C-14 labeled organic acid substrates. All bottles were incubated in the lake for a 12-hr period at a depth of 5 m. After incubation the samples were filtered through 0.45-micron cellulose acetate filters each of which was washed with sterile water and placed into scintillation vials containing Bray's fluor. Radioactivity was determined in a scintillation counter and calculations were made to determine bacterial numbers in relation to each organic acid. For pyruvic, fumaric, malic, acetic, glycolic, and citric acids an excellent correlation (r equals 0.98) existed between plate counts and acid uptake indicating that for these substrates maximum velocities of uptake are indeed indicative of actual bacterial populations. (Holoman-Battelle)
W73-12903

ANNUAL PRODUCTION OF A STREAM MAYFLY POPULATION: A COMPARISON OF METHODS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 05B.
W73-12905

ESTIMATION OF MORTALITY COEFFICIENTS FROM FIELD SAMPLES OF ZOOPLANKTON,
Scripps Institution of Oceanography, La Jolla, Calif.
E. W. Fager.
Limology and Oceanography, Vol 18, No 2, p 297-301, March 1973. 1 fig, 2 tab, 3 ref.

Descriptors: *Zooplankton, *On-site data collections, *Estimating, Computer programs, Animal populations, Mathematical studies, Programming languages, Animal physiology, Invertebrates.
Identifiers: *Mortality coefficients, Population dynamics, Calanus helgolandicus.

Point estimates of mortality of zooplankton in the field, based on relative numbers of individuals of different developmental stages observed in samples, require either a knowledge of the initial input of young or assumptions about constancy of input and constancy of mortality over adjacent stages. As the initial input is rarely known and the assumptions of constancy are probably often violated, the resulting uncertainty should be made evident in the estimates. This can be done by reporting the ranges of values of the mortality coefficients that would be consistent with the observed relative numbers of individuals. Methods of calculating these ranges are given. (Holoman-Battelle)
W73-12906

AN EVALUATION OF LIQUID SCINTILLATION COUNTING TECHNIQUES FOR USE IN AQUATIC PRIMARY PRODUCTION STUDIES,
Queen Elizabeth Coll., London (England). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-12907

MEMBRANE FILTER RETENTION--A SOURCE OF ERROR IN THE C-14 METHOD OF MEASURING PRIMARY PRODUCTION,
Atomic Energy of Canada Ltd., Chalk River (Ontario. Environmental Research Branch.
For primary bibliographic entry see Field 05A.
W73-12908

THE REDUCTION OF COPPER TOXICITY IN A MARINE COPEPOD BY SEDIMENT EXTRACT,
British Columbia Univ., Vancouver. Inst. of Oceanography.
A. G. Lewis, P. Whitfield, and A. Ramnarine.
Limnology and Oceanography, Vol 18, No 2, p 324-326, March 1973, 1 fig, 7 ref.

Descriptors: *Copper, *Toxicity, *Copepods, *Attenuation, *Bottom sediments, Water pollution effects, *Growth stages, Sediments, Heavy metals, Bottom sampling, Crustaceans, Invertebrates, Sea water, Zooplankton, Water pollution, Larval growth stage, Embryonic growth stage.
Identifiers: *Euchaeta japonica, Survival, Macroinvertebrates, Culture media, Membrane filtration, Eggs, Sample preparation.

Seawater extracts of marine sediments from two areas were added to copper-enriched seawater in which the prefeeding stages (egg, NI, NII) of Euchaeta japonica (Copepoda:Calanoida) were maintained. Sediment samples were collected with an Ekman and a Shipek sampler. A quantity of the sediment was extracted by allowing the sediment to stand in cold, membrane-filtered seawater. The extract was filtered, stored, diluted to 2 percent, and CuC12 and the prefeeding copepod stages were added. Survival through the prefeeding stages was used as an indication of the effects of the sediment extracts. Survival with the sediment extracts was greater than without, indicating an ability of some part of the extracted material to reduce the toxicity of the copper. The effect of the extracts was compared with that of a synthetic chelating agent to provide an 'equivalent' value. (Holoman-Battelle)
W73-12909

THE EFFECTS OF SUBLETHAL CONCENTRATIONS OF WHOLE BLEACHED KRAFTMILL EFFLUENT ON THE GROWTH AND FOOD CONVERSION EFFICIENCY OF UNDERYEARLING SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
P. W. Webb, and J. R. Brett.
Journal of the Fisheries Research Board of Canada, Vol 29, No 11, p 1555-1563, November 1972. 5 fig, 1 tab, 19 ref, append.

Descriptors: Water pollution effects, *Juvenile fish, *Bioassay, *Animal growth, *Animal metabolism, Growth rates, Lethal limit, Toxicity, Water temperature, Hydrogen ion concentration, Pulp wastes, Dissolved oxygen, Industrial wastes, Laboratory tests, *Bleaching wastes.
Identifiers: Bleached Kraft mill effluent, *Sockeye salmon, Oncorhynchus nerka, Food conversion.

Changes in growth rate and gross conversion efficiency were measured for underyearling sockeye salmon during and after exposure to full bleached kraftmill effluent (BKME). Five groups of fish were exposed for 56 days to 0, 1.0, 2.5, 10, and 15 percent BKME (v/v). Fresh 24-hr composite effluent at pH 6.8 was used daily after filtering. Growth was followed for a further 56 days after BKME exposure. Temperature was held at 15 C and dissolved oxygen between 90 and 100 percent air saturation. Growth rate and conversion efficiency were unaffected at 1.0 and 2.5 percent BKME. Reduced mean growth rate and conversion efficiency at 10 percent BKME were not statistically significant from controls but were considered to be biologically important in estimating threshold response levels. Significant reductions were found at 25 percent BKME. No recovery in retarded growth was found after exposure to BKME. Condition factor and percentage dry weight were not affected. It was concluded from computed response curves that the EC50 of the effluent was approximately 3.7 percent (v/v). (Holoman-Battelle)
W73-12913

A MATHEMATICAL MODEL OF THE NUTRIENT DYNAMICS OF PHYTOPLANKTON IN A NITRATE-LIMITED ENVIRONMENT,
Utah Water Research Lab., Logan.
W. J. Grenney, D. A. Bella, and H. C. Curl Jr.
Biotechnology and Bioengineering, Vol 15, No 2, p 331-358, March 1973. 9 fig, 2 tab, 34 ref.

Descriptors: *Phytoplankton, *Mathematical models, *Nitrates, *Cycling nutrients, *Deficient elements, Computer models, Absorption, Growth rates, Proteins, Nitrogen, Storage, Kinetics.
Identifiers: Monod model, Chemostat.

A three-compartment mathematical model is presented that represents a phytoplankton population capable of storing nitrogen in a nitrate-limiting environment. Growth rates are represented by saturation kinetics based on the concentrations in intracellular nutrient pools. Nutrient flow through a biological system is described using three forms of intracellular nitrogen (inorganic-nitrogen, organic intermediates, and protein). The three-compartment model was developed as part of a larger model to investigate mechanisms associated with nutrient limitation and recycling. The model demonstrated the changes which may occur in the nitrogenous constituents of a phytoplankton population with time and environmental conditions. The model also demonstrates three phenomena which have been observed in field and laboratory experiments but which are not represented by the customary Monod model: (1) uptake rates may significantly exceed net growth rates, (2) high growth rates may be encountered at very low environmental nitrate concentrations, and (3) the ratio of internal nitrogen to population size may change significantly during a study period. It is suggested that the amount of nitrogen in storage may be used as an indicator of the physiological state of a monospecific population. The one-compartment Monod model was shown to be inadequate to accurately represent population growth in chemostat experiments when intracellular storage is a significant factor. (Mortland-Battelle)
W73-12915

BEHAVIOR OF THE GOLDFISH AS AN EARLY WARNING SYSTEM FOR THE PRESENCE OF POLLUTANTS IN WATER,
Polytechnic Inst. of Brooklyn, N.Y. Dept. of Social Sciences.
For primary bibliographic entry see Field 05A.
W73-12916

PHOSPHATE CHEMISTRY IN LAKE SEDIMENTS,
Massey Univ., Palmerston North (New Zealand).
J. K. Syers, R. F. Harris, and D. E. Armstrong.
Journal of Environmental Quality, Vol 2, No 1, p 1-14, January-March 1973. 5 fig, 134 ref.

Descriptors: *Phosphates, *Reviews, *Lake sediments, Sorption, Eutrophication, Solubility, Mineralogy, Algae, Oxidation-reduction potential, Cycling nutrients, Sediment-water interfaces, Iron, Manganese, Calcium, Distillation, Aluminum, Chesapeake Bay, Biomass, Scenedesmus, Calcite, Sinks, Epilimnion, Hypolimnion, Phosphorus, Aquatic soils.
Identifiers: *Nutrient interchange, Desorption, Chemical mobility, Organic phosphorus, Hydroxyapatite, Esters, Linsley Pond, Lake Mendota, Bantam Lake.

The amounts and forms of inorganic and organic phosphate (P) in lake sediments are discussed in relation to sediment composition and properties. The ability of noncalcareous and calcareous sediments to sorb and desorb added P in the laboratory and in the lake environment is interpreted in terms of the amounts and reactivities of sediment components involved in the sorption of P; emphasis is placed on the role of an Fe-rich gel complex. Factors controlling the chemical mobility and biological availability of sediment inorganic and organic P are considered. Whether sediments act as a P source or sink is determined by sediment composition and limnological conditions. The factors involved in the interchange of P between the sediment interstitial water and the overlying water column are reviewed. The role of P in lake eutrophication is discussed briefly. (Mortland-Battelle)
W73-12917

ECOLOGICAL STUDIES OF CODIUM FRAGILE IN NEW ENGLAND, USA,
New Hampshire Univ., Durham. Dept. of Botany; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
R. A. Fralick, and A. C. Mathieson.
Marine Biology, Vol 19, No 2, p 127-132, March 1973. 8 fig, 1 tab, 20 ref.

Descriptors: *Ecology, *Marine algae, *Ecological distribution, *Limiting factors, *Plant physiology, Photosynthesis, Maine, Massachusetts, Surface waters, Plant growth, Standing crops, Reproduction, Water temperature, Light intensity, Salinity, Littoral, Germination, *New England, Primary productivity, Water quality.
Identifiers: *Codium fragile, Seasonal variation, Photosynthetic rates, Assimilation.

Because of the abundance of Codium fragile (Chlorophyta) in New England and its economic importance to scallop and oyster industries, a study was made of the factors responsible for its local growth and distribution. Systematic monthly collections and observations of the algal populations were made with SCUBA equipment in the sublittoral zones at each site in Boothbay Harbor, Maine and in Woods Hole and Wing Neck, Massachusetts. Results of the various growth studies conducted were recorded monthly; hydrographic data were correlated with the growth and reproductive studies. It is suggested that C. fragile is a warm-temperate plant that is growing near its northern limits in New England, but one that has not extended to its potential southern limits. (Holoman-Battelle)
W73-12918

SIMULATION STUDY OF PHYTOPLANKTON PHOTOSYNTHESIS AND GROWTH IN THE FRASER RIVER ESTUARY,
British Columbia Univ., Vancouver. Inst. of Oceanography.
M. Takahashi, K. Fujii, and T. R. Parsons.

Descriptors: *Photosynthesis, *Phytoplankton, Plant growth, *Model studies, Limiting factors, *Primary productivity, *Estuarine environment, On-site investigations, Light intensity, Water temperature, Nitrates, Saline water-freshwater interfaces, Salinity, Phosphorus, Estimating, *Canada, Environmental effects, Water quality, Hydrography, Nutrients, Marine algue, Physicochemical properties, Growth rates.
Identifiers: *Fraser Riverestuary (Canada), Chorophyll a, Photosynthetic rates, Data interpretation.

Phytoplankton photosynthesis was estimated by a simulation model of the Fraser River estuary (Canada). For this estimation, two kinds of information were considered; (1) the photosynthetic response of phytoplankton taken from the estuary to each environmental factor; (2) actual measurement of changes in each environmental factor in the estuary. As the major limiting factors, light, intensity, temperature, and nitrate were taken into account. Variations in these parameters were combined together under the assumption of the 'law of the minimum'; that is, only one of the environmental factors was considered to limit photosynthesis at any given time and place. From the results obtained, it could be shown which environmental factors actually limited phytoplankton photosynthesis in the Fraser River estuary at different times of the year and at different depths. (Holoman-Battelle)
W73-12919

PHYTOPLANKTON ALGAE: NUTRIENT CONCENTRATIONS AND GROWTH,
Woods Hole Oceanographic Institution, Mass.
P. Holmes, M. G. Kelly, G. M. Hornberger, and W. J. O'Brien.
Science, Vol 180, No 4092, p 1298-1300, June 1973. 6 ref.

Descriptors: *Phytoplankton, *Growth rates, *Primary productivity, *Nutrient requirements, *Limiting factors, Plant growth, Biomass, Plant populations, Aquatic environment, Aquatic algae, Aquatic plants, Standing crops, Nutrients.
Identifiers: *Growth kinetics, Substrate concentration.

Critiques of and a rebuttal to an article concerned with nutrients and growth of phytoplankton are presented. Some of the more pertinent points made include: (1) Growth yield depends on the concentration of a limiting nutrient and not necessarily on how fast growth can occur. (2) Considering Monod kinetics, nutrient addition will increase both growth rate and final biomass. Phytoplankton growth kinetics should be considered in terms of both standing crop and productivity, nutrient uptake or growth rate. (3) The Liebig thought of nutrient limitation in terms of enhanced yield and experiments which demonstrate only an enhancement of phytoplankton yield without showing a change in population growth rate are not always valid in determining a real limiting factor in the natural system. (Holoman-Battelle)
W73-12924

DDT IN SOME NEW ZEALAND MARINE AND FRESHWATER FAUNA,
Department of Agriculture, Wellington (New Zealand). Wallaceville Animal Research Center.
For primary bibliographic entry see Field 05A.
W73-12925

CHEMISTRY AND TROPHIC STATUS OF SEVEN NEW ZEALAND LAKES,
Department of Scientific and Industrial Research, Taita (New Zealand). Soil Bureau.
R. H. S. McColl.
New Zealand Journal of Marine and Freshwater Research, Vol 6, No 4, p 399-447, December 1972. 28 fig, 12 tab, 58 ref.

Descriptors: *Tropic level, *Heavy metals, *Water quality, *Nutrients, *Chemical analysis,

Limnology, Water analysis, Dissolved oxygen, Silica, Phosphorus, Nitrogen, Sulfates, Diatoms, Copper, Zinc, Water temperature, Alkalinity, Electrical conductance, Phosphates, Hydrogen ion concentration, Chlorophyll, Dissolved solids, Chlorides, Nitrates, Nitrites, Ammonia, Silicates, Iron, Manganese, Sodium, Calcium Potassium, Magnesium, Sampling, Stratification, Ions, Bicarbonates, Lake morphology, Depth, Land use, Regression analysis, Secchi disks.
Identifiers: *New Zealand lakes, Transparency, Atomic absorption spectrophotometry, Pigments, Staurastrum, Cyclotella, Dinobryon.

The chemistry of the surface and bottom waters of seven Rotorua lakes (Okataina, Rotoma, Tikitapu, Okareka, Rotokakahi, Ngapouri, and Okaro) was examined monthly between April 1970 and April 1971 in relation to the biology of the lakes. Twenty-four parameters were measured, including dissolved oxygen, major ions, silica, phosphorus, nitrogen, algal pigments, and some trace elements. All lakes were warm monomictic, second-class lakes. The waters were soft and variations between lakes in composition of major cations and anions appeared to be related to catchment differences. The major cations and C1 ion varied little with season. Sulfate varied seasonally in the hypolimnia of the most productive lakes (Okaro, Ngapouri, and Rotokakahi). Silica was abundant in all lakes, except Tikitapu where diatoms were poorly represented. Depletion of silica by diatom populations was only observed in the two most productive lakes (Okaro and Ngapouri). All lakes except Ngapouri showed anomalous silica distrubution with lower concentrations in the bottom waters at all times. Copper and zinc varied little between lakes and depths, but showed marked peakes during winter circulation. Data acquired from the analyses were used to classify the lakes by trophic level. Algal growth was most vigourous during winter cirulation and in some lakes a related phosphate 'depletion phase' occurred. Nitrate concentrations were low by world standards, except in the most productive lakes during winter circulation. Nitrite occurred irregularly in the surface waters of some lakes and in trace amounts in the hypolimnia of all lakes in late summer. (Little-Battelle)
W73-12928

INVESTIGATION OF THE ENVIRONMENTAL FACTORS WHICH AFFECT THE ANAEROBIC DECOMPOSITION OF FIBROUS SLUDGE BEDS ON STREAM BOTTOMS,
Lawrence Univ., Appleton, Wis.
For primary bibliographic entry see Field 05B.
W73-12936

BACTERIAL DEGRADATION OF DETERGENT COMPOUNDS,
Missouri Univ., Columbia. Div. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-12938

MARICULTURE IN ESTUARINE OIL--PIPELINE CANALS IN LOUISIANA,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
A. H. Harris, R. H. Kilgen, and D. Kraemer.
Available from NTIS, Springfield, Va. 22151 as COM-73-10513 - Price $3.00 printed copy; $1.45 microfiche. Louisiana State University Center for Wetland Resources Sea Grant Preprint, 1973. 8 p, 1 fig, 4 ref. (Paper presented to 4th Annual Meeting and Workshop of the World Mariculture Society, January 24-26, 1973, Monterrey, Mexico).

Descriptors: *Fish physiology, *Oily water, *Estuaries, *Louisiana, *Channel catfish, Growth stages, Water quality, Water pollution sources, Oil industry, Evaluation, Water pollution effects, Canals, Pipelines.
Identifiers: Mariculture studies.

The value of the biological productivity of the Louisiana estuaries is probably diminished by the presence of subsurface mineral deposits in the form of gas, oil, and sulphur. A study has been initiated to determine the suitability of utilizing some of the thousands of acres of estuarine oil-pipeline canals in Louisiana for mariculture purposes. Channel catfish, pompano, and white shrimp are selected test animals. Preliminary catfish culture results are reported. Channel catfish stocked in a 2.55 hectare brackish-water oilfield pipeline canal averaged 323 g after 6 months. Growth rates, water quality, and pathogenic organisms have remained within acceptable parameters. Predation, overbank flooding, and harvesting are the most obvious problems. (Woodard-USGS)
W73-12951

STANDING CROPS OF NATURAL FISH POPULATIONS IN BRACKISH-WATER OIL FIELD PIPELINE CANALS,
Nicholls State Univ., Thibodaux, La. Dept. of Biological Sciences.
R. H. Kilgen, A. H. Harris, and D. Kraemer.
Available from NTIS, Springfield, Va. 22151 as COM-73-10512 - Price $3.00 printed copy; $1.45 microfiche. Louisiana State University Center for Wetland Resources Sea Grant Preprint, 1973. 15 p, 1 fig, 4 tab, 11 ref. (Paper presented to 4th Annual Meeting and Workshop of World Mariculture Society, January 24-26, 1973, Monterrey, Mexico).

Descriptors: *Fish physiology, *Oily water, *Estuaries, *Canals, *Louisiana, Pipelines, Water pollution effects, Fish, Growth stages, Fish reproduction, Marshes, Oil industry, Water quality.
Identifiers: *Mariculture studies.

Brackish-water oilfield pipeline canals located in coastal Louisiana were rotenoned so that mariculture studies could be conducted. Standing crops within the canals ranged from 133 to 369 kilograms per hectare, with an average minimum wholesale value of $38.80 per hectare. Centrarchids and channel catfish were found in lower salinity canals (5.5 to 8.5 parts per thousand), but not in a higher salinity canal (25 parts per thousand). Sea catfish, oyster toadfish, and gray snapper were found only in the latter. The canals contained from 15 to 28 different fish species, with clupeids, sparids, and sciaenids predominating. Standing crops within pipeline canals are apparently higher than in surrounding areas, but potential brood stock may never reproduce due to their being trapped within the canals. (Woodard-USGS)
W73-12952

A SYMPOSIUM ON THE PRESERVATION AND MULTIPLE-USE PROBLEMS IN THE GREAT LAKES,
Department of Fisheries and Forestry, Ottawa (Ontario).
P. M. Higgins.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 15-22, 1972.

Descriptors: *Water pollution sources, *Water pollution effects, *Great Lakes, *Industrial wastes, *Environmental effects, Effluents, Thermal pollution, Heavy metals, Solid wastes, Ecology, Ecosystems, Aquatic life, Water quality, Recreation facilities, Social aspects, Water pollution control, Pollution abatement, Multiple-purpose projects, Management.

The Great Lakes, the largest interconnected bodies of freshwater in the world, were long thought to have had an infinite capacity for receiving man's pollutants. The Lakes were thought to be a bottomless sink. Recent events in the lower Great Lakes and in Lake Michigan have proven how wrong this concept has been. The Lakes have very distinct capacities for receiving wastes. In the case of Lakes Erie and Ontario, the dangerous loading limits of phosphorus are .03 and .08 g/sq m per yr, respectively. The loading to Lake Erie is already greater than the dangerous level, and the projected loading (1986) for Lake Ontario without appropriate treatment will see Lake Ontario move to a eutrophic condition. Some of the ecological changes which man has wrought in the Great Lakes System are presented and other activities which have potential for further ecological upset are identified. (See also W73-12960) (Woodard-USGS)
W73-12962

MERCURY IN CANADIAN FISH,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
E. G. Bligh.
Can Inst Food Sci Technol J, Vol 5, No 1, p A6-A14. 1972. Illus.
Identifiers: *Canada, *Fish, Japan, *Mercury, Pollution, Sweden, Industrial wastes.

Japanese and Swedish experiences with Hg pollution are reviewed. Some highlights of the Canadian national survey on Hg contamination are presented including type of fish, location and Hg content. Industrial sources that may be contaminating waters and the incorporation of Hg contaminated fish into animal feeds are considered.--Copyright 1973, Biological Abstracts, Inc.
W73-12970

SIMPLIFICATION OF THE BLUE MOUNTAIN LICHEN COMMUNITIES NEAR A ZINC FACTORY,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
H. N. Thomas, III.
Bryologist. Vol 75, No 3, p 315-324. 1972.
Identifiers: *Water pollution effects, *Lichen, Metal, *Pennsylvania, Simplification, Tolerance, *Zinc factory.

In Lehigh Water Gap (Pennsylvania) near a zinc factory, species diversities of corticolous, saxicolous, lignicolous, and terricolous lichen communities are markedly reduced compared to the species diversities of lichen communities in Delaware Water Gap. Nine lichen species were found in Lehigh Water Gap; 84 in Delaware Water Gap. Foliose, fruticose, crustoe species, respectively, are increasingly more tolerant of the conditions around the Zn factory. The effect of the Zn factory on the Blue Mountain lichen flora is discernible up to 6 km to the west of Lehigh Water Gap and 15 km to the east.--Copyright 1973, Biological Abstracts, Inc.
W73-12973

TRISODIUM NITRILOTRIACETATE IN DRINKING WATER: METABOLIC AND RENAL EFFECTS IN RATS,
North Carolina Univ., Chapel Hill. Dept. of Pathology.
K. R. Mahaffrey, and R. A. Goyer.
Arch Environ Health. Vol 25, No 4, p 271-275. 1972. Illus.
Identifiers: Acetates, Metabolic effects, *Nitrilotriacetate (Trisodium), Rats, Renal effects, *Potable water.

Trisodium nitrilotriacetate (Na-NTA) at either 0.01%, 0.10% or 1% (weight/volume) was given to rats in drinking water with or without 200 micrograms lead (Pb)/ml. At the 1% Na-NTA level, rats became ill and were autopsied after 4 wk of the experiment. These rats had a vacuolar tabular nephropathy, hyperglycemia and a marked glycosuria. Rats given 0.01% and 0.10% Na-NTA with or without Pb displayed no histologic changes in kidney, liver, brain or pancreas but had elevated blood glucose levels. The Na-NTA alone lowered

Pb content of kidneys, whereas Na-NTA with Pb did not enhance Pb deposition in kidney. The hyperglycemic effect of Na-NTA was confirmed in a second strain of rats. The mechanism whereby Na-NTA influenced blood glucose levels is unknown but may relate to trace metal chelation.--Copyright 1973, Biological Abstracts, Inc.
W73-12982

EFFECTS OF STRESS ON PHEASANTS PREVIOUSLY GIVEN POLYCHLORINATED BIPHENYLS,
South Dakota Cooperative Wildlife Research Unit, Brookings.
R. B. Dahlgren, R. L. Linder, and W. L. Tucker.
J Wildl Manage. Vol 36, No 3, p 974-978, 1972.
Identifiers: Phasianus colchicus, *Pheasants, Starvation, Polychlorinated biphenyls, Pesticide residues.

Adult hen pheasants (Phasianus colchicus) that received 16 capsules each containing 50 mg of polychlorinated biphenyls (PCB), Aroclor 1254, once a week, and those given 7 capsules each containing 50 mg of PCB at 3.5-day intervals, were alternately starved for 2 or 3 days and then fed for 2 days. Controls treated similarly lived longer than birds treated with PCB. Brain residues of PCB in treated birds were considerably higher (highest greater than 240 ppm) in birds stressed by starvation when compared with PCB-treated birds that were not starved (highest 24 ppm). Stresses that cause loss of weight can be dangerous to birds having a body burden of PCB.--Copyright 1973, Biological Abstracts, Inc.
W73-12995

THE EFFECTS OF DIESEL FUEL ON A STREAM FAUNA,
California Univ., Berkeley. Museum of Vertebrate Zoology.
R. B. Bury.
Calif Fish Game. Vol 58, No 4, p 291-295, 1972.
Identifiers: *Diesel fuel, *Fauna, Fish, Invertebrates, Petrochemical wastes, Streams, Transportation, *California (Hayfork Creek).

The spillage of approximately 2000 gallons of diesel fuel into Hayfork Creek, California, resulted in a large kill of invertebrates, fishes and other life. Subsequent effects on the stream fauna are discussed. This study examines the increasing threat of pollution in remote areas due to the transportation of petrochemicals.--Copyright 1973, Biological Abstracts, Inc.
W73-12997

SOURCES OF CO2 FOR NUISANCE BLOOMS OF ALGAE,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Weed Sci. Vol 20, No 5, p 492-497, 1972. Illus.
Identifiers: *Algae, Ankistrodesmus-falcatus, *Bacteria, Carbon, Chlamydomonas, Chlorella-pyrenoidosa, Coelastrum-microporum, Eutrophication, *Nuisance blooms, Oxides, Scenedesmus-dimorphus, Scenedesmus-quadricauda, Staurastrum-sp.

Bacterial production of CO2 from sucrose substrate increased growth of 7 spp. of algae (Ankistrodesmus falcatus (Corda) Ralfs, Chlamydomonas sp. Chlorella pyrenoidosa Chick, Coelastrum microporum Naegeli, Scenedesmus dimorphus Kutz, S. quadricauda (turp.) Breb, and Staurastrum sp.) in CO2-linked laboratory cultures. Decomposition of organic matter in pond water also supplied enough CO2 to support good algal growth in cultures deprived of other sources of CO2. Estimates of CO2 production from decay of dissolved organic matter in 6 pond waters ranged from 0.32 to 3.53 mg/L per 24 hr. The carbonate-bicarbonate equilibrium system is a major source of CO2 for algal photosynthesis. However, in waters of low or extremely high alkalinity, this system will not support high rates of photosynthesis. In such waters CO2 from decomposition will stimulate photosynthesis. Decomposable organic compounds must be considered with N and P as factors responsible for accelerated eutrophication and nuisance algal blooms.--Copyright 1973, Biological Abstracts, Inc.
W73-13000

5D. Waste Treatment Processes

SUMMARY REPORT: COMPREHENSIVE SEWERAGE STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 05G.
W73-12359

TOWN OF CAIRO WASTE WATER REPORT.
Diachishn (A.) and Associates, New York.

Available from the National Technical Information Service as PB-214 027, $3.00 in paper copy, $1.45 in microfiche. Prepared for Greene County Planning Department, Cairo, New York. August 1972. 18 p, 3 fig, 3 tab. N.Y.P. 246.

Descriptors: *Planning, *Sewerage, *Waste water treatment, Projections, Costs, Federal grants, *New York, Treatment facilities, City planning.
Identifiers: *Cairo (New York).

A planning prospectus is presented for the possible construction of a wastewater disposal system for the small town of Cairo, New York (year round population approximately 800) and 3 nearby hamlets which have adequate public water supplies but no sanitary sewerage. A previous study for comprehensive sewerage is reviewed, population growth to 2020 is forecast, possible wastewater treatment facilities are outlined, and a sanitary sewer district to encompass the hamlets of Cairo, including South Cairo, Purling and Acra, is proposed. Costs are also estimated and it is concluded that construction of the facilities is not likely without federal and state grants. (Elfers - North Carolina)
W73-12366

REGIONAL UTILITIES STUDY: SEWERAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.

Prepared for Capitol Region Planning Agency, Hartford, Conn., 1969. 134 p, 13 fig, 30 tab, 40 ref, glossary. UPA: CONN P-78 (G).

Descriptors: *Sewerage, *Waste water treatment, Land use, Projections, Treatment facilities, Planning, *Connecticut, Regional analysis, Regional development.
Identifiers: Service areas, Hartford (Conn), Sewage loads, Treatment plant capacity.

Detailed background data related to sewerage are presented. Planning procedures involved in formulating the final sewerage plans presented in the Regional Utilities Study are illustrated. The data and planning information fall under several categories: (1) background data on population and land use plus planning concepts; (2) sewerage inventory data on existing systems and treatment plants, sources of wastewater, service areas, and sewage flows; (3) the future needs for sewerage including estimates of future sewage flows and service areas; and (4) alternative sewerage plan elements such as proposed treatment plant capacities, their receiving streams, and their costs. Most of the data are presented on a town by town basis. (Elfers - North Carolina)
W73-12369

WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS,
Wisconsin Univ., Madison.
J. T. Quigley, and D. A. Stuiber.
Available from NTIS, Springfield, Va. 22151 - COM-73-10158 - Price $3.00 printed copy; $1.45 microfiche. Sea Grant Advisory Report No 1, WIS-SG-72-401, November 1972. 17 p, 5 fig, 4 tab, 4 ref.

Descriptors: *Waste water treatment, *Food processing industry, *Water pollution control, *Suspended solids, Lipids, Proteins, Aerobic treatment, Anaerobic bacteria, Waste treatment, Methodology, Industrial wastes, Lake Michigan.
Identifiers: Anaerobic processes, Aerobic processes.

At the request of a commercial fish processor operating on Lake Michigan, Sea Grant Advisory Services personnel investigated a waste water disposal problem. Large volumes of waste water resulting from the processing of alewives for fish meal were being inadequately treated in a lagoon system. Since the partially treated effluent then entered Green Bay, an abatement order had been issued by the State of Wisconsin. The waste water problem was studied in two stages. First, practices were examined to determine whether process revisions could be made to reduce the amount of lipids, protein and other suspended solids in the discharge. While little progress could be made within the constraints of the existing process, a new step was developed to remove more solids and to increase product recovery. Secondly, the resulting waste water discharge was studied to improve treatment practice. Owing to the complexity of the material in the discharge, an anaerobic treatment stage was required. Design was focused on combination anaerobic-aerobic systems. (Woodard-USGS)
W73-12420

A PILOT FISH-POND SYSTEM FOR UTILIZATION OF SEWAGE EFFLUENTS, HUMBOLDT BAY, NORTHERN CALIFORNIA,
California State Univ., Humboldt, Arcata.
G. Allen, G. Conversano, and B. Colwell.
Available from NTIS, Springfield, Va 22151 as COM-73-10333 Price $3.00 printed copy; $1.45 microfiche. Sea Grant Publication HSU-SG-3, September 1972. 25 p, 3 fig, 3 tab, 6 ref.

Descriptors: Fisheries, *Fertilization, *Sewage effluents, Ponds, *Construction costs, *California, Real costs, Structural analysis, Engineering, *Water reuse.
Identifiers: *Fish pond construction.

In October of 1969, the California Wildlife Conservation Board authorized funds to construct two fish ponds to undertake pilot studies of fertilization with sewage effluents to enhance the growth of fish. The city of Arcata granted to California State University, Humboldt, the use of its area for a minimum of ten years for aquaculture purposes. All real costs (estimated at $53,732.00) in the construction of these two ponds are presented, and the engineering and construction problems encountered are described. In addition, ways are suggested to minimize such problems and to reduce the costs for any similar ponds which might be planned in the future either for experimental or production purposes. (Woodard-USGS)
W73-12434

SYSTEM FOR REMOVING COLOR FROM PAPER MILL LIQUID WASTE,
Owens-Illinois, Inc., Toledo, Ohio. (assignee)
H. C. Croom.
U. S. Patent No. 3,736,254, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1669, May 29, 1973.

Descriptors: *Patents, Wood wastes, *Color, Lime, Carbon dioxide, Pulp and paper industry, Treatment, Pollution abatement, Water pollution control, Water quality control, Chemical reactions, Pulp wastes, *Waste water treatment.
Identifiers: Paper mill wastes.

Waste water discharged from a paper mill is passed through the following steps: lime and lime mud additions, mixing, clarification, and carbonation. Clarification takes place under alkaline conditions to effect precipitation of calcium salts and conjoint agglomeration separation of color bodies. The resulting effluent is carbonated with carbon dioxide, promoting further precipitation of calcium salts and conjoint agglomeration of color bodies. (Sinha-OEIS)
W73-12445

WATER DECOLORIZATION,
M. Ghassemi, H. L. Recht, and E. V. Kleber.
U. S. Patent No. 3,736,255, 4p, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1669, May 29, 1973.

Descriptors: *Patents, Pollution abatement, *Industrial wastes, Chemical reactions, *Filtration, Treatment, Color, Pulp and paper industry, *Waste water treatment, Water quality control, Water pollution control, *Tannery wastes.
Identifiers: Lanthanum salts, Rare earths, Textile mills.

A method is provided for chemically removing coloring matter from water by treating the coloring matter-containing water with a trivalent rare earth salt, generally as a mixture of such salts, to form an insoluble rare earth precipitate and then separating the precipitate from the water. The rare earth precipitant salt, such as lanthanum chloride or lanthanum sulfate, may be regenerated by first heating the rare earth precipitate to form rare earth oxides and to drive off the organic components by converting them to carbon dioxide and water. The rare earth oxide may be used directly in acidic waters or converted to a soluble rare earth salt by using acid such as dilute hydrochloric or sulfuric acid. (Sinha-OEIS)
W73-12446

METHOD OF REDUCING PHENOLIC WASTE,
General Electric Co., Pittsfield, Mass. (assignee)
J. H. Thayer, and E. C. Y. Fan.
U. S. Patent No. 3,736,292, 2 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1675, May 29, 1973.

Descriptors: *Patents, *Phenols, Resins, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Chemical reactions.
Identifiers: Aldehyde.

Phenol content is markedly reduced in waste discharged from apparatus used for producing phenol-aldehyde resins. Aqueous solutions produced by the reaction between the phenol and aldehyde at different stages of the reaction and containing different proportions of phenol are mixed together at a temperature in the range of about 30C. to 45C. This provides rapid separation into two solution layers, of which one contains low phenol concentration and may be discharged as waste, and the other contains high phenol concentration which is returned to the reaction vessel for further use in resin production. The low phenol waste solution thus discharged enables a reduction in pollution of streams into which products of the resin process are usually discharged. (Sinha-OEIS)
W73-12447

PROCESS AND APPARATUS FOR REMOVING MERCURY FROM WASTE WATER,
Sobin Chlor-Alkali, Inc., Orrington, Maine. (assignee)
P. De Angelis, A. R. Morris, and A. L. MacMillan.
U. S. Patent No. 3,736,253, 4 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1669, May 29, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Metals, Resins, Coals, *Chelation, *Filtration, Chemical reactions, Pollution abatement, Water pollution control, Water quality control, *Mercury.
Identifiers: Anthracite coal, Chemical treatment.

Mercury laden water can be treated with sodium borohydride to reduce dissolved mercury to the metallic form. The water treated with reducing agent is filtered through a pressure leaf filter coated with a filter aid, contacted with finely divided anthracite coal and then with a chelating resin. Three examples are given. (Sinha-OEIS)
W73-12449

ACTIVATED SLUDGE PLANT,
R. H. Uden.
U.S. Patent No. 3,735,870, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1578, May 29, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Activated sludge, *Aeration, *Industrial wastes, Pollution abatement, Water quality control, Water pollution control, Treatment facilities.

Connected in series are a septic or digester tank, aeration tanks, a settling tank and a final aeration tank. Sewage enters the digester tank where all heavy grit and large particles remain to decompose and break down to be carried into the next stage, the aeration cycle. Here it meets re-aerated sludge entering from an advanced point in the cycle. The mixture of sewage and sludge then passes along a series of aerating tanks, to a settling tank where the activated sludge is pumped from the bottom to the first aeration tank, the floating scum is pumped into the digester tank, and the purified sewage is passed to a final aeration tank from whence it may be discharged into a body of water or onto the land. (Sinha-OEIS)
W73-12451

FLOTATION MACHINE WITH VERTICALLY RECIPROCATING AERATORS,
A. M. Fedotov, E. S. Alexeev, G. A. Denisov, K. A. Rundkrist, and A. A. Skrunde.
U. S. Patent No. 3,735,868, 5 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1578, May 29, 1973.

Descriptors: *Patents, *Aeration, Equipment, *Flotation, *Mineral industry, *Waste water treatment, *Industrial wastes, Pollution abatement, Water quality control, Water pollution control.

A flotation machine incorporating a chamber for pulp and a means for removing separated products, also contains vibration aerators and ducts for the supply of air to piston like portions. There are also openings for the passage of pulp during the upward stroke of the aerators. The piston-like portion of each aerator is provided with flaps of elastic material adapted to close the openings and for the passage of pulp in the course of the aerator downward stroke and open them in the course of the aerator upward stroke. As the result of such an arrangement, the operation of the machine is accompanied with an intensive stirring and aeration of pulp at low values of the vibrational speed of the aerator, owing to which there takes place a considerable reduction of the electric energy consumption and aerator wear. (Sinha-OEIS)
W73-12452

WASTE DISPOSAL ASSEMBLY,
A. G. Borden.
U.S. Patent No. 3,734,852, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1312, May 22, 1973.

Descriptors: *Patents, *Sewage treatment, *Pollution abatement, Equipment, Heat treatment, Bacteria, *Waste treatment, *Water pollution treatment, *Water quality control, *Sanitary engineering, Water pollution control, Waste disposal.

Sewage is subjected to thermal treatment in the first chamber of this assembly. It is held until it attains a temperature at least that of boiling water to reduce the bacterial level to a relatively low tolerable level. A jacket forming the second chamber is provided with a gas inlet and a gas outlet so that hot gas passes through the second chamber heating the first chamber by conduction. (Sinha-OEIS)
W73-12454

WASTEWATER TREATMENT SYSTEM,
Consolidated Foods Corp., Hayward, Calif. Shasta Beverages Div.
F. A. Karr.
U.S. Patent No 3,734,850, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1311, May 22, 1973.

Descriptors: *Patents, *Waste water treatment, *Oxygenation, *Industrial wastes, Pollution abatement, *Aeration, Bacteria, Enzymes, Water quality control, Water pollution control, Bubbles, *Biological treatment, Biochemical oxygen demand.
Identifiers: *Gas bubbles.

A method and apparatus are provided for treating wastewater by the injection of an oxygen-containing gas, such as air or oxygen or mixtures of the same, into the wastewater while controlling the maximum size of the injected gas bubbles to increase the adsorbed oxygen content retained by wastewater. The injection is made under pressure. The injection is through elements at the bottom of a sump or on stream in a recycle line to and from the sump. A bed of perforate balls on the bottom of the sump provides an excellent surface area for bacterial treatment by coated enzymes injected into the system. (Sinha-OEIS)
W73-12455

CIRCULAR FLOTATION SYSTEM,
Petrolite Corp. St. Louis, Mo. (assignee)
W. F. Burns.
U.S. Patent No. 3,733,272, 6 p, 6 fig, 3 ref; Official Gazette of the United State Patent Office, Vol 910, No 3, p 903, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, *Suspended solids, *Flotation, Equipment, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Dissolved air flotation.

A flotation system removes suspended material from a liquid in a circular vessel with a vertical axis. An upright cylindrical inlet chamber resides centrally on the vessel and receives in a mixing zone in its lower portion the liquid containing dissolved flotation gas through a horizontal tangential inlet. Vertical vanes above the mixing zone direct the circulation liquid into a radial and linear flow rising upward in the inlet chamber. An inverted conical cover supported by the vanes provides an unbroken annular nozzle to direct liquid flow from the inlet chamber in a path forming an acute angle with the top of the vessel. Circumferential liquid outlets on the vessel remove the clarified liquid adjacent the sidewall at a certain selected horizon. Accumulated floating deposits and settled solids are removed through the rotary action of a blade which deposits them into a sump. Settled solids are moved by a bottom scraper into the same sump and both are removed. (Sinha-OEIS)
W73-12457

PROCESS OF TREATING AND PURIFYING SEWAGE, PARTICULARLY OF SEWAGE CONTAMINATED WITH DETERGENTS,
K. Marschall.
U.S. Patent No 3,733,268, 2 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 902, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, Oil wastes, *Flocculation, *Filtration, *Detergents, Ozone, Treatment, Pollution abatement, Water pollution control, Water quality control, Atmospheric pressure.

Following preliminary treatment for removal of oil, the sewage is introduced into a container which is held under atmospheric pressure. A mixture of ozone and other gases is introduced. The sewage is sucked from the lower portion of the container and is conducted through a recirculation system. The prepurification may comprise not only removal of oil but aeration, filtration and removal of flocculants. (Sinha-OEIS)
W73-12458

WASTE WATER PURIFICATION BY BREAKPOINT CHLORINATION AND CARBON ADSORPTION,
Environmental Protection Agency, Washington, D.C. (assignee)
D. F. Bishop, A. F. Cassel, and T. A. Pressley.
U.S. Patent No 3,733,266, 4 p, 1 fig, 1 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 902, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, *Adsorption, *Chlorination, Ammonia, *Carbon, Chemical reactions, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Breakpoint chlorination.

Wastewater having an NH3--N content in the range of 8-30 mg/liter of wastewater is passed into a mixer reactor. Chlorine is added in the amount of 55-300 mg/liter of wastewater to provide a Cl:NH3--N ratio of about 8-10:1. The pH is maintained at a value between 5.8 and 9.5 providing for breakpoint chlorination. The mixture now substantially free of NH3--N, is introduced into a carbon adsorption zone. Ammonia removal by breakpoint chlorination proceeds according to: 3Cl2 + 2NH3 goes to N2 + 6HCl. The breakpoint is defined as the point where the NH3--N is reduced to zero, free available chlorine is detected and the total residual chlorine is minimized. (Sinha-OEIS)
W73-12459

CROSS-FLOW FILTRATION PROCESS FOR REMOVAL OF TOTAL ORGANIC CARBON AND PHOSPHATES FROM AQUEOUS SEWAGE EFFLUENTS,
Atomic Energy Commission, Washington, D.C. (assignee)
K. A. Kraus, and H. A. Mahlman.
U.S. Patent No 3,733,265, 4 p, 3 fig, 5 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 902, May 15, 1973.

Descriptors: *Patents, Phosphates, Organic matter, *Nutrient removal, *Filtration, *Waste water treatment, *Liquid wastes, *Sewage treatment, Chemical reactions, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Chemical treatment.

A method is set forth for the removal of organic material and phosphate from liquid sewage. The sewage is mixed with finely divided carbon or graphite and at least one additive from the group consisting of a salt which hydrolyzes to a hydrous oxide, or the hydrous oxide itself. The pH is adjusted to a value no greater than 4. The mixture is then moved tangentially past one face of a porous substrate at a pressure of from 3 to 100 psi to produce a clarified filtrate on the opposite side of the substrate. Six examples are cited. (Sinha-OEIS)
W73-12460

WASTE TREATMENT SYSTEM,
Kimberly-Clark Corp., Neenah, Wis. (assignee)
M. G. Mandt.
U.S. Patent No 3,733,263, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 910, No 3, p 901, May 15, 1973.

Descriptors: *Patents, *Waste water treatment, *Suspended solids, *Aeration, Equipment, Pollution abatement, Water pollution control, Water quality control, Biochemical oxygen demand.

A single unit utilizes low power input. A rotating ejector bank periodically scours the aeration tank bottom. Oxygen-rich gas is introduced within an aeration zone causing the liquid to move circuitously about a baffle. A portion of the sewage passes under the baffle into a central clarifying zone. The solids settle out and the liquid is removed. The solids are removed by the use of the rotating ejector bank or banks. (Sinha-OEIS)
W73-12461

NEUTRALIZATION OF METAL CONTAINING WASTES,
Secretary of the Interior, Washington, D.C. (assignee)
L. C. George, L. N. Ballard, and V. H. Feeler.
U.S. Patent No 3,736,239, 3 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 910, No 5, p 1666, May 29, 1973.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Metals, Pollution abatement, Water quality control, Water pollution control, *Hydrogen ion concentration, Sodium compounds, Chemical reactions, *Filtration, *Neutralization.
Identifiers: *Cyanide, Electroplating industry, Chemical treatment, Sodium hydroxide, Hydrogen cyanide, Metal oxides.

The process comprises the slow addition of an acid, metal-containing liquid waste stream to an alkaline, cyanide and metal-containing liquid waste stream. The order of addition is critical in order to avoid the formation of hydrogen cyanide. It is important that the mixing be done slowly with agitation. The reaction is best carried out in a vessel equipped with stirring or agitation and an alkaline scrubber. Any evolved gas is scrubbed with an alkaline solution, such as sodium hydroxide, as a safety precaution to collect any hydrogen cyanide gas that may evolve. The pH should not be allowed to drop below a value of about 4 to 4.5. The precipitate may be recovered by filtration and further processed for recovery of contained metals, preferably by oxidation to form the corresponding metal oxides. (Sinha-OEIS)
W73-12462

POSSIBILITIES OF WATER TREATMENT BY MEANS OF A MAGNETIC FIELD,
Glowny Instytut Gornictwa, Katowice (Poland).
J. Sablik.
Water Econ, Vol 20, No 7, p 52-67, 1970. 9 fig, 4 tab, 51 ref.

Descriptors: *Water treatment, Sedimentation, Salts, Sewage treatment, Sludge, Water properties, Flocculation, Foreign research, Magnesium compounds, Iron compounds, Coagulation, Calcium compounds, *Waste water treatment, Dissolved oxygen, Bibliographies, Sanitary engineering, *Industrial water.
Identifiers: Poland, Scale-forming compounds, *Magnetic fields, Sediment concentration, Electromagnets.

Because of the great demand in industry and the need to treat industrial water and sewage, water treatment is becoming one of the principal problems in water economy. Much time has been devoted to investigations into the effects of different physicochemical reactions on water environment. Achievements in the treatment of water environment in a magnetic field are presented. The technological aspects, results of the basic investigations, and the hypothesis used in attempting to justify the phenomenon observed are discussed. Consideration should be given to the possibilities of using data from previous investigations to obtain a more thorough knowledge of surface and interphase phenomena in a water environment. (USBR)
W73-12481

WASTEWATER TREATMENT DESIGN RELATED TO BIOLOGICAL GROWTH SUPPORTED BY ACTIVATED CARBON,
Mississippi State Univ., State College. Dept. of Civil Engineering.
E. C. McGriff, Jr.
Available from the National Technical Information Service as PB-222 175, $3.00 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, Mississippi State Report, July 1973. 46 p, 18 fig, 9 tab, 8 ref. OWRR-A-067-MISS (1).

Descriptors: *Waste water treatment, *Activated carbon, *Oxygen uptake, *Kinetics, Biological treatment, *Oxygen demand, Biological properties, Chemical oxygen demand.

The objective was to evaluate the response of the biological activity at the carbon solid-liquid interface of an expanded bed adsorber. The evaluation of the biological activity was performed by conducting non-flow kinetic studies, continuous flow kinetic studies, and oxygen uptake studies. The research was divided into two phases. Phase I consisted of the non-flow kinetics whereas Phase II consisted of the continuous flow kinetics and the oxygen uptake studies. The results indicate that the response of the biological film supported by granular carbon can be defined by conducting oxygen uptake studies. Biological activity of the attached film was established through the use of an energy-total energy constant. The average constant calculated was 0.50 mgO2 utilized per mg COD removed. This constant can be utilized to predict oxygen demand for the attached film on granular carbon used in expanded bed adsorbers.
W73-12494

PHOSPHORUS REMOVAL AND PLANT OPERATION STUDIES AT FORT WAYNE, INDIANA,
Fort Wayne Water Pollution Control Plant, Ind.
P. L. Brunner, M. Spiegel, and C. F. Niles, Jr.
Available from the National Technical Information Service as PB-222 383, $7.75 in paper copy, $1.45 in microfiche. Environmental Protection Agency report, EPA-R2-73-274, June 1973, 106 p, 15 fig, 52 tab, 16 ref. EPA Project 11060 DXX.

Descriptors: *Nutrient removal, Flotation, Sludge, *Waste water treatment, *Indiana, Phosphorus, Treatment facilities, Water softening, Lime.
Identifiers: *Phosphorus removal, Luxury uptake, *Sludge bulking, *Fort Wayne (Ind).

The demonstration project at the Fort Wayne, Indiana Wastewater Treatment Plant showed that the addition of a portion of the spent lime sludge from the City's water conditioning plant to the influent to the aeration tanks would slightly increase the normal capacity of the activated sludge to remove phosphorus. The same addition, 31,500 to 35,500 pounds per day of spent lime sludge solids, prevented sludge bulking during the warmer months of the year when poor settling sludge is experienced. Duplicate pilot plants were evaluated for the removal of phosphorus by luxury uptake and acid elutriation and as a conventional activated sludge unit. Removals in both units were comparable to those attained in the full scale plant. Higher phosphorus removals were achieved when chemicals (lime, ferric chloride, polyelectrolytes,

pickling acid) were used singly or in combination in the pilot plants. A survey of the flow and characteristics of the sewage in various locations in the City demonstrated that the concentration of total and soluble phosphorus varies with location and, therefore, can to some extent be controlled. Preliminary studies with a tertiary treatment pond receiving treatment plant effluent and storms water overflow indicate that BOD5 and suspended solids concentrations are substantially reduced during passage through the pond. (EPA)
W73-12500

STUDY OF UTILIZATION AND DISPOSAL OF LIME SLUDGES CONTAINING PHOSPHATES,
Monsanto Research Corp., Dayton, Ohio. Dayton Lab.
R. E. Opferkuch, T. Ctvrtnicek, and S. M. Mehta.
Available from the National Technical Information Service as PB-222 354, $8.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report No. EPA-R2-73-282, June 1973. 78 p, 23 fig, 27 tab, 26 ref, 8 append. 17070 FBE. 14-12-199.

Descriptors: *Sludge disposal, *Phosphates, *Tertiary treatment, Economics, *Beneficiation, Municipal wastes, Disposal, *Waste water treatment, Fertilizers, Lime, Slaking, Magnesium, Cost comparisons.
Identifiers: Phosphate enrichment, Phosphate industry, *Lime sludges, Thermal beneficiation, Carbonation, Calcining, Transportation costs, Fertilizer value.

Tertiary treatment of municipal sewage with lime effectively removes phosphate but generates considerable quantities of sludge and a sludge disposal problem. Evaluation of technical and economic aspects of potential sludge utilization, or disposal concepts considered agricultural applications, conversion of sludge to products of known market value, and transporting sludge from the plant site by various means. The phosphate industry appeared to offer the greatest potential for utilization of the sludge provided sludge phosphate content could be enriched. Methods considered for phosphate enrichment were: thermal beneficiation, carbonation, and calcining/slaking. While the latter method was the most efficient, process complexity and economics militate against this general approach. In areas where the magnesium content of wastewater is relatively high, sludge processing to recover both phosphate and magnesium could be economical but would require considerable development. Furthermore, process complexity would not suit this approach to treatment plant operations. Preliminary cost estimates are presented for several levels of process complexity in liming secondary effluent with potential recovery of lime and phosphate. A summary of transportation costs, by various means, for removal of sludge from the treatment plant site is also presented. (EPA)
W73-12501

STABILIZATION OF SEWAGE SOLIDS BY THE CHANNEL AERATION PROCESS,
Wisconsin Univ., River Falls.
M. W. Wehking, J. M. Bostrack, L. J. Monette, and L. D. Hansen.
Environmental Protection Agency report, EPA-R2-73-213, June 1973. 90 p, 15 fig, 41 tab, 28 ref, 4 append. EPA Project 17070 DIZ.

Descriptors: *Sludge disposal, *Sludge digestion, *Biological treatment, *Aerobic treatment, Dissolved oxygen, Cost analysis, *Waste water treatment, *Oxidation lagoon, *Aeration.
Identifiers: Oxidation ditch, *Surface aeration, Volatile solids reduction.

The use of an oxidation ditch for treatment of domestic sewage sludges by aerobic digestion was superior to anaerobic digestion. Maximum reductions of 64.7% for volatile solids and 67.8% for COD were achieved. Low temperatures inhibit the process such that below temperatures of 55F neither of these reductions exceeded 45%. At moderate temperatures the DO content of the mixed liquor appears to be the factor limiting COD and volatile solids reductions. When the DO content exceeds 1.5 ppm the reductions of COD and volatile solids reached their maximum values, however, nitrate and phosphate concentrations in the mixed liquor increased to values of 30 ppm and 115 ppm respectively. The dewatering characteristics of the digested sludge were no better than those of raw sludge. Evidence also indicates that this process is better suited to continuous rather than semi-continuous operation. The process also requires close control of operating conditions. Operating costs were $36.50 per ton of solids treated. (EPA)
W73-12502

ELECTRICAL STIMULATION OF MICROBIAL WASTE TREATMENT,
Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
J. S. Schultz.
Available from the National Technical Information Agency, as PB-222 384, in paper copy $3.50, in microfiche $1.45. Environmental Protection Agency Report No. EPA-R2-73-278, June 1973. p 46, 18 fig, 3 tab. 17050 DGJ.

Descriptors: *Electricity, *Fermentation, Electric fields, Electric currents, Bacteria, Yeast, Growth rates, Waste treatment.
Identifiers: *Stimulation, Membrane transport, Batch culture, Continuous culture.

This project has been directed towards the evaluation of the effect of electrical fields, AC and DC, on the metabolism and growth of micro organisms. Test systems used were batch culture, (aerobic and anaerobic), continuous culture, and the use of genetic mutants for membrane transport studies. Voltages were applied to cell suspensions with inert platinum and carbon electrodes, and were limited to levels below the onset of electrolysis of water. Care was exercised in maintaining constant temperatures for comparative experiments, since on direct effect of applied currents was resistive heating of the solutions. The growth medium was designed so that the carbon source (usually glucose) was the limiting nutrient. For most of the studies, analysis of cell growth and glucose utilization was used to evaluate the effects of electric fields. In batch fermentation experiments some stimulation of growth and sugar utilization was found over a current range of 40 to 120 ma DC, however, the amount of stimulation was within the range of experimental variations. In continuous fermentation, cell growth was not significantly stimulated by electric fields. Electrical fields caused some increase in the accumulation and transport of galactose by E. coli.
W73-12503

DISINFECTION OF SEWAGE EFFLUENTS,
Illinois State Water Survey, Urbana.
F. W. Sollo, Jr., and H. F. Mueller.
Available from the National Technical Information Service as PB-222 355, $6.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency report number, EPA-670/2-73-029, July 1973. 69 p, 37 fig, 7 tab, 35 ref. EPA Project 17060 DNU.

Descriptors: *Disinfection, Halogens, *Chlorine, *Waste water treatment, *Sewage effluents, *Hydrogen ion concentration, Temperature, Coliforms, Bacteria.
Identifiers: *Bromine disinfection.

In view of difficulties encountered with chlorine as a disinfectant under certain conditions, particularly due to ineffectiveness of the chloramines at high pH, bromine is being evaluated as an alternate or supplement to chlorine for disinfection of treated wastewater. Chlorine and bromine are being compared under varying conditions of pH and temperature, using an activated sludge effluent as the test substrate. Both dosage and residuals of chlorine and bromine are being correlated with percent survival of coliforms, fecal coliforms, and total bacterial numbers. Results indicate that in wastes of this type, the effectiveness of chlorine decreases with increasing pH, whereas the effectiveness of bromine increases. Thus it appears possible that bromine may have advantages in wastes of high pH. Combinations of chlorine and bromine are also being evaluated, and it appears that pretreatment with chlorine, followed by bromine, may produce effective disinfection at lower cost than bromine alone. (EPA)
W73-12504

FLUIDIZED BED CLARIFICATION AS APPLIED TO WASTEWATER TREATMENT,
Research Triangle Inst., Durham, N. C.
J. C. Orcutt.
Copy available from GPO Sup Doc as EP1.23/2-72-032, $1.50; microfiche from NTIS as PB-216 604, $1.45 in microfiche. Environmental Protection Agency, Technology Series Report EPA-R2-72-032, December 1972. 98 p, 21 fig, 10 tab, 21 ref. EPA Project 17030 EYA. Contract 14-12-912.

Descriptors: *Waste water treatment, *Coagulation, *Solids contact processes, Sludge treatment, *Separation techniques, *Mathematical models, Silica.
Identifiers: *Sludge blanket, Aluminum sulfate, Ferric sulfate, Activated silica.

An experimental study of the application of a fluidized sludge blanket clarifier to the coagulation and separation of wastewater solids has been made to determine the effects of controlled process variables on the treatment achieved. Experiments using alum and ferric chloride coagulants were carried out in 12- and 24-inch diameter columns by systematic variation of wastewater pH, coagulant dose, upflow fluid velocity, and blanket depth. The results were analyzed using regression analysis techniques, and empirical relationships were derived relating the variables to the removal of suspended solids, total organic carbon, phosphorus, and coagulant metal ions. The sludge production rate was also correlated empirically with the operating variables. A study of the settling rates of discharged sludge and the fluidized blanket was made by direct observation. (Kreissl-EPA)
W73-12505

TERTIARY TREATMENT OF COMBINED DOMESTIC AND INDUSTRIAL WASTES,
Cornell, Howland, Hayes and Merryfield, Corvallis, Oreg.
J. W. Lee, Jr.
Copy available from GPO Sup Doc as EP1.23/2 73 236, $2.60; microfiche from NTIS as PB-222 251, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-236, May 1973. 203 p, 67 fig, 14 tab, 38 ref. EPA Project 11060 DLF.

Descriptors: *Waste water treatment, *Aerobic treatment, *Tertiary treatment, *Industrial wastes, Activated sludge, *Domestic wastes, Flocculation, Filtration, Chemical precipitation, Phosphates, Treatment facilities, *Oregon, Biochemical oxygen demand.
Identifiers: Pet food processing wastes, Mixed media filter, Tube clarifier, Alum, BOD5, Polyelectrolyte, Treatment costs, Phosphate removal, Combined treatment, *Tualatin (Ore).

Operation of a secondary-tertiary treatment facility for combined domestic and pet food manufacturing industrial wastewaters at the City of

Tualatin, Oregon, was studied for 16 months. The study demonstrated the feasibility of automated tertiary treatment for small communities treating a combined domestic and industrial wastewater at a reasonable cost. The system was designed for an average daily flow of 280,000 gpd and a BOD5 load of 630 pounds per day. The extended aeration activated sludge process with a design detention time of 24 hours was employed for secondary treatment. An experimental 60 degree inclined tube settler located in the aeration-surge basin provided secondary effluent clarification. The tertiary system consisted of a four step process: (1) alum and polyelectrolyte coagulation, (2) flocculation, (3) inclined tube sedimentation, and (4) mixed media filtration. The tertiary system demonstrated the capability to produce an effluent quality of less than 10 mg/l BOD5 and 5 mg/l suspended solids with a total phosphate residual of 0.1 to 1.0 mg/l (as P). The total capital cost of the facility was $245,800. Based on total annual cost, the cost of treatment at the design conditions was $0.42 per 1000 gallons processed and $0.19 per pound of BOD5 removed. (EPA)
W73-12512

IDENTIFICATION AND CONTROL OF PETROCHEMICAL POLLUTANTS INHIBITORY TO ANAEROBIC PROCESSES,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
J. C. Hovious, G. T. Waggy, and R. A. Conway.
Copy available from GPO Sup Doc as EP1.23/2 73-194; $1.25; microfiche from NTIS as PB-222 287, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-194, April 1973. 103 p, 37 fig, 18 tab, 21 ref. EPA Project 12020-FER.

Descriptors: *Chemical wastes, *Industrial wastes, *Anaerobic treatment, Anaerobic digestion, Methane bacteria, Filtration, *Waste water treatment, Filters, Organic wastes, Phenols.
Identifiers: Inhibition, Acrylates, *Crotonaldehyde.

Identification studies were made on potentially inhibitory materials using an unacclimated anaerobic biomass. Identified inhibitory materials and concentrations in mg/l for a 50 percent decrease in activity were acrolein (20-50), formaldehyde (50-100) crotonaldehyde (50-100), 2-ethyl-1-hexanol (500-1000 mg/l), methyl isobutyl ketone (100-300), diethylamine (300-1000 mg/l), acrylonitrile (100 mg/l), 2-methyl-5-ethylpyridine (100), ethylene dichloride (150-500), ethyl acrylate (300-600), and phenol (300-1000). Inhibitory effects were more severe at high volatile acid concentrations. Acclimated cultures were developed in mixed digesters for crotonaldehyde, phenol, and to some degree to ethyl acrylate. No acclimation was observed for sodium acrylate. An anaerobic filter was acclimated to 600 mg/l crotonaldehyde as compared to the 50-100 mg/l unacclimated inhibitory level. Treatment of formaldehyde, ethyl acrylate, phenol, and acrylonitrile indicated synergestic inhibition. Anaerobic filter studies also indicated that crotonaldehyde inhibition could be avoided in a chemical manufacturing waste by dilution, successful treatment of 'hard' surfactant containing wastes also was noted. (EPA)
W73-12513

DEMOSTRATION OF A WASTE DISPOSAL SYSTEM FOR LIVESTOCK WASTE,
Moore Engineering, Inc., West Fargo, N. Dak.
C. R. Moore.
Copy available from GPO Sup Doc as EP1.23/2, 73-245, $0.85; microfiche from NTIS as PB-222 253, $1.45. Environmental Protection Agency, Technology Seires Report, EPA-R2-73-245, May 1973. 50 p, 7 tab, 10 fig, 12 ref. EPA Project 13040 FTX.

Descriptors: *Cattle, Hogs, Sheep, Waste treatment, *Settling basins, Nitrates, Groundwater, Biochemical oxygen demand, Chemical oxygen demand, *Farm wastes, Feed lots, Solid wastes, Dissolved oxygen, *Waste water treatment.
Identifiers: *Stockyards, *Hydrasieve, Sheyenne River, Truck washrack, Solids separation.

Laboratory studies of livestock waste were conducted both before and after the construction of an enlarged settling basin, a hydrasieve at the truck washrack and a two cell waste stabilization pond. A determination of the effectiveness of these two systems and the application of them to feedlots and other livestock facilities in the area were the main objectives. The settling basin and hydrasieve were effective in removing solids and COD from the truck washrack waste. Reductions in COD, total, suspended, and settleable solids were 23.9, 14.8, 50 and 80 percent, respectively. DO increased 42.8 percent and total solids decreased 3 percent across the hydrasieve. This 3 percent consisted of straw and other floating debris which would not be removed at the stabilization pond. The effectiveness of the stabilization ponds was generally good. The BOD5 of the final effluent was reduced 48.6 percent over that of the drainpipe which had drained directly into the Sheyenne River during previous years. (Kreis-EPA)
W73-12517

METHODS FOR PULP AND PAPER MILL SLUDGE UTILIZATION AND DISPOSAL,
Crown Zellerbach Corp. Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 05E.
W73-12519

THE SHAGAWA LAKE PROJECT: LAKE RESTORATION BY NUTRIENT REMOVAL FROM WASTEWATER EFFLUENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
K. W. Malueg, R. M. Brice, D. W. Schults, and D. P. Larson.
Copy available from GPO Sup Doc as EP1.23: 73-026, $0.85; microfiche from NTIS as PB-222 255, $1.45. Environmental Protection Agency, Ecological Series Report, EPA-R3-73-026, January 1973. 49 p, 13 fig, 1 tab, 4 ref. PA Program Element 1B1031.

Descriptors: *Eutrophication, *Lakes, *Tertiary treatment, *Algal control, *Phosphorus, Nutrients, Municipal wastes, Mathematical models, Limnology, *Minnesota, *Nutrient removal, *Waste water treatment.
Identifiers: *Shagawa Lake (Minn), *Lake restoration, Algal assay, Nutrient budget.

The U.S. Environmental Protection Agency (EPA) has initiated a research project at Ely, Minnesota, to demonstrate the restoration of eutrophic Shagawa Lake by nutrient removal (primarily phosphorus) from municipal wastewater effluent while permitting such treated effluent to continue to flow into the lake. Studies utilizing an advanced wastewater treatment pilot plant showed that phosphorus could readily be removed and the treated effluent did not promote algal blooms in the receiving waters. The National Eutrophication Research Program (NERP) of EPA began operating and evaluating a full-scale advanced wastewater treatment plant in early 1973. Nutrient removal in the plant is primarily by chemical precipitation with lime and is designed to give a final effluent of 0.05 mg/l total phosphorus or less. NERP will evaluate the extent and rate of recovery of Shagawa Lake until at least 1976. Lake data for this period will be compared to that obtained during the six years prior to advanced wastewater treatment. (EPA)
W73-12520

RECONDITION AND REUSE OF ORGANICALLY CONTAMINATED WASTE SODIUM CHLORIDE BRINES,
Dow Chemical Co., Midland, Mich. Environmental Research Lab.
R. D. Fox, R. T. Keller, and C. J. Pinamont.
Copy available from GPO Sup Doc as EP1.23/2:73-200, $2.10; microfiche from NTIS as PB-222 256, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-200, May 1973. 110 p, 39 fig, 8 tab, 8 ref. EPA Project 12020-EAS.

Descriptors: *Brine disposal, *Wastewater treatment, Adsorption, Activated carbon, Industrial wastes, *Phenols, Operating costs, Water reuse, *Mathematical models, *Sodium chloride.
Identifiers: *Acetic acid, *Brine reuse, Waste recovery, Organics.

A plant of 100 gal/min capacity was constructed and operated for one year to demonstrate the feasibility to remove and recover phenol and acetic acid from an 18% sodium chloride brine by adsorption on fixed beds of activated carbon. The purified brine was used for production of chlorine and caustic soda. Separate electrolytical test-cell evaluation of the purified brine showed it to be equivalent to pure brine. Regeneration of the carbon was accomplished by desorption with dilute sodium hydroxide. The phenol desorbed was recycled to the phenol manufacturing plant while the acetate regenerant was processed to underground disposal wells. More than 23 million gallons of brine were purified. Fourteen cycles of phenol adsorption and regeneration and 105 cycles of acetic acid adsorption and regeneration were completed with no significant deterioration of carbon performance. Phenol removal to <1 ppm was accomplished at 50-140 gal/min and 15-70C with an effective carbon capacity of 0.167 lb/lb. Optimum regeneration was with 4% NaOH at 55-70C. Removal of 90% of the acetic acid from brine requires <80 gal/min flow rate and <40C temperature, the resultant loading is 0.04 - 0.06 lb/lb of carbon. The projected net cost of purifying this waste brine for reuse was $1.32 per 1000 gallons. (EPA)
W73-12521

ION EXCHANGE COLOR AND MINERAL REMOVAL FROM KRAFT BLEACH WASTES,
Montana State Univ., Bozeman. Dept. of Civil Engineering.
R. L. Sanks.
Copy available from GPO Sup Doc as EP1.23/2:73-255, $2.35; microfiche from NTIS as PB-222 257, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-255, May 1973. 189 p, 91 fig, 35 tab, 63 ref. EPA Project 12040 DBD.

Descriptors: *Bleaching wastes, *Waste water treatment, Pulp and paper industry, Effluents, Resins, Lime, Water reuse, Costs, Color, *Ion exchange, *Desalination, *Demineralization, Pulp wastes, Industrial wastes.
Identifiers: Bleach plant wastes, *Color removal.

Laboratory evaluations of twenty resins and seven carbons for removing color and minerals from a four-stage kraft bleach plant showed resins were equal to carbon for decoloring the combined waste. With few exceptions, resins were unsuited for decoloring wastes from each stage separately. Except for success in the use of weak wash to regenerate Amberlite XAD-8 resin, utilization of mill liquors for regeneration was unsuccessful. Sulfuric acid, caustic, and ammonia were good regenerants, but lime was poor. Single stage ion exchange produced water adequate for unbleached pulping. Two-stage desalination produced water adequate for bleached pulping. Any of the continuous counter-current ion exchange processes are probably adequate for producing water for bleached pulping. The estimated cost for desalination including amortization over a 10 year period at 9 percent interest, labor,

chemicals, maintenance, and repairs are estimated to vary from $1.38/1000 gal (for the non-optimized process used in the laboratory) to $0.42/1000 gal (with estimated 90 percent cation regeneration efficiency, 85 percent anion regeneration efficiency, and 87 percent product recovery). (EPA)
W73-12522

METHODS FOR THE FURTHER IMPROVEMENT OF SPENT LIQUOR RECOVERY IN LENZING,
Lenzinger Zellulose- und Papierfabrik A.G. (Austria).
H. Danninger.
Trans. available from Institute of Paper Chemistry Appleton, Wisconsin 54911. Price: $5.00. Typescript Translation of Wochenblatt fur Papierfabrikation, Vol 98, No 18, p 725-727, September 30, 1971. 4 fig.

Descriptors: *Pulp wastes, Water pollution control, *Waste dilution, *Filtration, Pulp and paper industry, Diffusion, Foreign countries, Europe, Effluents, Discharge (Water), Sulfite liquors, Magnesium compounds, Calcium compounds, Filters, Industrial wastes, Efficiencies, *Waste water treatment.
Identifiers: *Sulfite pulping, *Austria, Chemical recovery, Magnesium base liquors, Washing, Pulp washing, Spent sulfite liquors, Spent liquors, Sulfite mills.

The Austrian sulfite pulp and paper mill, Lenzinger Zellulose- und Papierfabrik AG., uses the magnesium-base sulfite process which lends itself more readily to recovery of the spent cooking liquor than does the conventional calcium-base process. As much as 95 percent of the spent sulfite liquor is removed from the digested pulp by a four-stage diffusion washing process which minimizes dilution of the waste liquor. The installation of a new filter line is planned in order to increase the recovery efficiency above 95 per cent and proportionally reduce the amount of effluent discharged into receiving waters. (Speckhard-IPC)
W73-12524

JOINT TREATMENT OF PULP MILL EFFLUENTS AND MUNICIPAL SEWAGE.

Paper Trade Journal, Vol 156, No 18, p 30, May 1, 1972.

Descriptors: *Pulp wastes, *Waste water treatment, *Sewage treatment, Municipal wastes, Biological treatment, Effluents, Pulp and paper industry, Activated sludge, Chlorination, Treatment, Biodegradation, Operating costs, Capital costs, Sulfur bacteria, Feasibility studies, Sewage districts, *Wisconsin, Chlorine, Economic feasibility, Costs, Bacteria, Recycling, Nutrients, Nitrogen compounds, Phosphorus compounds, Solids contact processes, Research and development, Mixing.
Identifiers: Spent liquors, *Green Bay (Wis), *Combined treatment.

The major findings of a feasibility study are reported, in which the sewage from the Green Bay, Wisconsin, Metropolitan Sewerage District was treated jointly with effluents from four local paper mills, using four variations of the activated sludge process. Among these variants, the contact stabilization process proved to be the most successful. The growth of filamentous sulfide-utilizing bacteria in the mixed waste liquors was controlled by continuous dosing of the recycled activated sludge with chlorine. For satisfactory operation of the biological oxidation process, nitrogen and phosphorus compounds had to be added as supplementary nutrients. Capital and operating costs for a full-scale installation are indicated. Recommendations for further research are also listed. (Witt-IPC)
W73-12528

DETOXIFICATION OF KRAFT PULP MILL EFFLUENT BY AN AERATED LAGOON,
International Pacific Salmon Fisheries Commission, New Westminister (British Columbia).
J. A. Servizi, and R. W. Gordon.
Progress Report, No 26, 1972. 26 p. 3 fig, 8 tab, 7 ref.

Descriptors: *Pulp wastes, *Treatment facilities, *Aerated lagoons, *Toxicity, Waste waters (Pollution), Operation and maintenance, Pollution abatement, Industrial wastes, *Waste water treatment, Biodegradation, Water quality control, Water pollution control, *Canada, Pulp and paper industry, Douglas fir trees, Softwood, Coniferous trees, Pollutants.
Identifiers: *Kraft mills, *Malfunction, *Black liquors, *Pulpwood, Green wood, Spruce, Spent liquors.

The occasionally substandard detoxification of kraft pulp mill effluents during their treatment in an aerated lagoon at Kamloops Pulp and Paper Co. Ltd. (recently acquired by Weyerhaeuser Canada Ltd.) prompted an eight-month study during a period of inplant changes for pollution abatement. Compared with a laboratory treatment unit, the aerated lagoon responded similarly to kraft mill effluents. Spills of black liquor (spent alkaline pulping liquor) were responsible for some, but not for all occasions of substandard detoxification. Other causes of residual toxic matter resistant to biooxidation were associated with the pulping of green Douglas-fir and sprucewood chips. (Brown-IPC)
W73-12529

START-UP OF BIOLOGICAL TREATMENT FACILITIES FOR PULP AND PAPER MILL WASTES,
H. A. McLean, and K. L. Murphy.
Pulp and Paper Magazine of Canada, Vol 73, No 7, p 89-92 (p T189-192), July 1972. 7 fig, 9 ref.

Descriptors: *Biological treatment, *Pulp wastes, *Treatment facilities, Lagoons, *Waste water treatment, Monitoring, Operation and maintenance, Measurement, Biochemical oxygen demand, Dissolved oxygen, Hydrogen ion concentration, Nutrients, Oxygen demand.
Identifiers: Process variables.

The startup of two biological effluent treatment installations having five-day retention times is described. Requirements for seeding and nutrient additions were studied in the laboratory and verified in the full-scale installations. The biological activity in the lagoon was monitored by measuring the rate of oxygen uptake. This measurement was related to five-day BOD and dissolved oxygen along the lagoon profile. Reductions and variations in pH with biological treatment are illustrated. Recommendations are made for those aspects deserving special consideration during startup. (Brown-IPC)
W73-12531

NEW TRENDS IN WASTE WATER TREATMENT AND RECYCLE,
Bechtel Corp., San Francisco, Calif.
G. A. Sawyer.
Chemical Engineering, Vol 79, No 16, p 120-128, July 24, 1972. 6 fig, 3 tab.

Descriptors: *Reviews, *Waste water treatment, *Water reuse, *Recycling, Municipal wastes, Sewage treatment, Costs, Industrial wastes, Sludge treatment, Technology, Chemcontrol.

The status of waste water treatment technology is reviewed. Various chemical treatment methods and water recycling schemes are evaluated. Both in-plant recycling systems for various industries and municipal waste water reclamation systems for industrial and general use are covered. Advantages and problems of various regional waste water treatment programs are analyzed, including schemes in which municipal sewage is treated jointly with industrial effluents. Cost data for various treatment processes are indicated. Industrial users of reclaimed municipal waste waters are listed. (Witt-IPC)
W73-12533

SELECTING WASTE WATER AERATION EQUIPMENT,
Keene Corp., Aurora, Ill. Water Pollution Control Div.
R. J. Nogaj.
Chemical Engineering, Vol 79, No 8, p 95-102, April 17, 1972. 5 fig, 3 tab.

Descriptors: *Aeration, *Treatment facilities, Waste water treatment, *Activated sludge, *Aerated lagoons, *Equipment, Pollution abatement, Water quality, Surface waters, Lagoons.
Identifiers: *Aeration.

Aerators commonly used in aeration lagoons and in activated sludge processes for waste water treatment are reviewed. Characteristics and operating parameters of different aerators are discussed. Guidelines are presented for selecting the correct type of aerator for specific applications. Equations are given for calculating the number of dimensions of aerators needed, as well as the size and shape of treatment tanks. (Witt-IPC)
W73-12534

THE TTC TEST FOR THE CONTROL OF EFFLUENT PURIFICATION (TEST TTC - NARZEDZIEM KONTROLI PROCESU OCZYSZCZANIA),
K. Lelonkiewicz.
Przeglad Papierniczy, Vol 28, No 4, p 129, April 1972. 2 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Monitoring, *Bioassay, Pulp and paper industry, Effluents, Colorimetry, Testing procedures, Enzymes, Biological treatment, Analytical techniques, Sludge digestion, Oxygen demand, Biochemical oxygen demand, Chemical oxygen demand, Recycling, Foreign research.
Identifiers: Kraft mills, Sulfite mills, Dehydrogenases, Triphenyltetrazolium chloride.

In monitoring the purification of pulp mill effluents by the activated sludge process, the use of 2,3,5-triphenyltetrazolium chloride (TTC) offers a simple, albeit controversial, test method for ascertaining the activity of dehydrogenases. The procedure involves incubating a sludge sample in the dark with TTC, followed by ethanolic extraction of the red triphenylformazan formed. This reduced compound, which serves as an indicator of biooxidation, is then determined colorimetrically. A modified version of the TTC test was applied to activated sludge samples used in treating effluents from sulfite- and sulfate-process pulp mills. The results were compared with those obtained by determinations of chemical and biochemical oxygen demands, oxygen indexes, and other standard analytical procedures. Under steady operating conditions, the dehydrogenase activity remained constant. The enzyme activity was sensitive to changes in pollution load and to disturbances in recycling and in aeration. Instances in which increased loads caused no corresponding increase in enzyme activity were correlated with failure of the process to increase in purification efficiency. (Stapinski-IPC)
W73-12535

EFFLUENT TREATMENT IN PAPER AND BOARD MILLS.

International Paper Board Industry, Vol 15, No 1, p 27-28, 30, January 1972.

Descriptors: *Waste water treatment, *Pulp and paper industry, *Reviews, Effluents, Recycling, Waste treatment, Biochemical oxygen demand, Biological treatment, Suspended solids, Solids contact processes, *Pulp wastes, Industrial wastes, Waste treatment, Treatment, Water pollution, Water pollution treatment, Water reuse, Mixing.
Identifiers: *White water, Board mills, Paper mills, Paper machines.

Methods of treating aqueous effluents from paper and board mills are reviewed, including recycling of paper machine waste waters (white waters), primary treatment to remove suspended solids, secondary or biological treatments to reduce biochemical oxygen demand, premixing of wastes, and treatment of condensates. (Witt-IPC)
W73-12537

WASTE TREATMENT PLANT AT ITT RAYONIER INC. MILL, FERNANDINA BEACH, FLORIDA.

Southern Pulp and Paper Manufacturer, Vol 35, No 7, p 36, 38, 40, July 10, 1972. 3 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Sulfite liquors, Pulp and paper industry, Florida, Effluents, Water pollution control, Industrial wastes, Bleaching wastes, Pollution abatement, Evaporation, Incineration, Recycling, Water reuse.
Identifiers: *Raycycle process, *Sulfite mills, Sulfite pulping, Bleach plants, Chemical recovery.

A schematic description is given of the 'Raycycle' process for treating aqueous wastes of a sulfite dissolving pulp mill. The new process combines spent pulping liquors with effluents from the bleach plant's hot caustic extraction stage for subsequent joint evaporation, combustion, and chemical recovery to reduce the pollution load of the treated effluent. (Witt-IPC)
W73-12541

RAYONIER MAKES MAJOR BREAKTHROUGH IN SULFITE POLLUTION CONTROL.

Paper Trade Journal, Vol 156, No 20, p 50-51, May 15, 1972. 2 fig.

Descriptors: Pollution abatement, Pulp and paper industry, Water pollution treatment, Evaporation, Effluents, *Pulp wastes, Bleaching wastes, Incineration, Sulfite liquors, *Treatment facilities, Chemcontrol, Water pollution, *Florida, Waste water treatment.
Identifiers: *Sulfite pulping, *Chemical recovery, Spent sulfite liquors, Alkaline extraction, Bleaching, Combustion, Spent liquors, Sulfite mills, Raycycle process.

ITT Rayonier Inc. has developed a new pollution control process called 'Raycycle', as part of a program to control water pollution at its Fernandina Beach sulfite pulp mill near Jacksonville, Florida. In this process, the spent sulfite pulping liquor is combined with the effluent from the alkaline extraction stage of the pulp bleaching sequence, and the joint waste waters are evaporated, burned, and subjected to a chemical recovery and regneration process. (Witt-IPC)
W73-12542

INVESTIGATIONS ON WASTE WATER CLARIFICATION WITH ACTIVATED CARBON (UNTERSUCHUNGEN ZUR RESTABWASSERKLARUNG MIT AKTIVKOHLE),
Technische Universitaet, Darmstadt (West Germany). Wasser- and Abwasserforschungsstelle.
H-L. Dalpke.
Das Papier, Vol 26, No 1, p 4-10, January, 1972. 10 fig, 2 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Activated carbon, Adsorption, Effluents, Pulp and paper industry, Foreign research, Europe, Effluents, Water pollution treatment, Waste treatment, Industrial wastes, Waste waters (Pollution), Pollution abatement, Water pollution control, Color, Organic matter, Pollutants, Biochemical oxygen demand, Physical control, Chemcontrol.
Identifiers: *Cellulose, Cellulose fibers, *Germany.

The removal of biologically harmful substances, characterized by their consumption of oxygen, from pulp and paper mill effluents is essential to the preservation or restoration of waterways. In addition to biological purification methods, several chemical and physical processes for reducing the five-day biochemical oxygen demand of industrial effluents have been suggested. Adsorption of pollutants on activated carbon is one of the more promising methods. This process has been investigated in several laboratory experiments in which mill effluents were subjected to the action of activated carbon contained in four sequential cylindrical vessels. Under the experimental conditions used, effluents could be completely decolored at specific flow rates of 1.5 liters per hr per kg of activated carbon. In addition, this treatment completely eliminated residual papermaking fibers and reduced the average five-day biochemical oxygen demand to 25 mg of oxygen per liter, or less. The technique and the apparatus used are described and illustrated. Their theoretical operating principle is also explained, notably various kinds of adsorption mechanisms. (Wise-IPC)
W73-12543

PRACTICAL DECOLORIZATION OF KRAFT MILL EFFLUENTS (PRAKTYKA USUWANIA BARWY SCIEKOW POSIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Warsaw (Poland).
C. Leszczynski.
Przeglad Papierniczy, Vol 28, No 3, p 88-89, March, 1972. 1 fig, 13 ref.

Descriptors: *Pulp wastes, *Color, *Lime, *Waste water treatment, Pulp and paper industry, Effluents, Chemical precipitation, Recycling, Pollution control treatment, Water quality control, Sedimentation, Bleaching wastes, Dewatering, Calcium carbonate, Calcium compounds, United States, Reviews.
Identifiers: *Kraft mills, Decoloration, Lignin, Tannins, Bleach plants, Chemical recovery, Causticizing.

Waste waters discharged by sulfate-process (kraft) pulp and paper mills contain color bodies comprising mainly lignin derivatives and tannins. In the concentrations currently encountered in natural waters, these materials are not toxic to aquatic organisms, but they interfere with the penetration of sunlight and with recreational water use, and raise the costs of effluent treatment. The activated sludge process does not effectively degrade color bodies. Among other treatment methods, such as chemical precipitation, adsorption on activated carbon, and reverse osmosis, only the lime process is deemed practical for industrial large-scale use. Developed and patented in the USA, it involves mixing of the effluent with lime and sedimentation of the resulting precipitate, followed by dewatering to 40-60% dryness for recycling to the causticizing plant of a kraft mill. Three American kraft mills have already introduced this process, namely, Interstate Paper Corp. at Riceboro, Georgia, Georgia-Pacific Corp. at Woodland, Maine, and Continental Can Co. at Hodge, Louisiana. Operating experiences at these three locations are described. Also mentioned are pilot plant investigations at International Paper Co. and American Can Co. regarding lime treatment for decoloring of bleach plant effluents, as well as on modifications of kraft pulp bleaching processes aimed at reducing the load of colored substances in waste waters. (Stapinski-IPC)
W73-12544

ENVIRONMENTAL CARE AT PULP MILLS, RESULTS AND EXPECTATIONS,
National Swedish Environment Protection Board, Stockholm. Environmental Care Project.
K-E. Lekander.
Svensk Papperstidning, Vol 75, No 1, p 5-14, January 15, 1972. 17 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Foreign research, *Pollution abatement, Governments, Water reuse, Oxygen, Treatment, Economic impact, Research and development, Budgeting, Industrial wastes, Water pollution treatment, Waste treatment, Waste water treatment, Europe.
Identifiers: *Sweden, Kraft mills, Sulfite mills, Bleaching, Condensates.

Several of the research projects currently conducted by the Swedish National Environmental Protection Board (SSVL) under a five million dollar budget for the years 1970-1973 are discussed. They concern water recirculation in a closed kraft pulp and paper mill system; the same system in combination with oxygen bleaching; the reuse of overflows and accidental spill waters; and the treatment of condensates at kraft and sulfite mills. Results expected of these studied should permit new mills to be constructed from 1976 on to operate essentially free of water pollution without endangering their competitive market position. (Brown-IPC)
W73-12545

VOLATILE BIOCHEMICAL OXYGEN-CONSUMING MATERIALS OCCURRING IN THE SULFITE PROCESS WITH LIQUOR NEUTRALIZATION AND CONDENSATE RECOVERY: THEORETICAL STUDY, (FLYKTIGA BIOKEMISK SYREFORBRUKANDE AMNENS UPPTRADANDE I SULFITPROCESSEN VID LUTNEUTRALISERING OCH KONDENSATATERFORING, TEORETISK UNDERSOKNING),
Angpanneforeningen, Stockholm (Sweden).
O. Axelsson, and L. G. Wahlund.
Svensk Papperstidning, Vol 75, No 8, p 287-296, April 30, 1972. 9 fig, 9 tab. English summary.

Descriptors: *Pulp wastes, *Sulfite liquors, *Water reuse, Water pollution control, Industrial wastes, *Waste water treatment, Evaporation, Neutralization, Biochemical oxygen demand, Recycling, Theoretical analysis, Water pollution, Pollutants, Byproducts, Hydrogen ion concentration, Water conservation.
Identifiers: Sulfite pulping, Spent sulfite liquors, Condensates, Acetic acid, Furfural, Methanol, Chemical recovery.

A theoretical calculation was made of the effects to be expected in sulfite pulp mills in which spent sulfite liquor is neutralized and recycled to the wood digester along with recovered evaporator condensates obtained at different liquor pH and with varying degrees of condensate reuse. Complete closing of the liquor cycle was found to be impossible, because the volume of condensates exceeds the water demand of the acid-making (cooking liquor preparation) system. Excess condensates may conceivably be reused as wash water in a sectional spent liquor recovery system, a major proportion being introduced into the dilute ('thin') liquor, while a minor portion would accompany the washed pulp and be lost down the screen room sewer. The neutralization of thin liquor affects only the acidic impurities and should decrease the biochemical oxygen demand by up to 50%. The same effect upon acetic acid is obtained when condensate is recycled. This should decrease sewer losses of methyl alcohol and furfural to 15%, since a part of these compounds will be entrained by flue gases in the acid-making stage. By combining the neutralization of thin liquor with recycling of condensates, the acetic and formic

acid losses could be limited to about 10% of the total amounts formed, so that only about 10% of all oxygen consuming volatiles would be discharged with the mill's aqueous effluent. (Brown-IPC)
W73-12546

MICROBIOLOGICAL TREATMENT PARAMETERS OF BLEACHED KRAFT PULP MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
C. C. Walden, A. E. Birkbeck, and J. C. Mueller.
Pulp and Paper Magazine of Canada, Vol. 73, No. 6, p 49-54 (p T153-T158), June, 1972. 9 fig, 14 ref.

Descriptors: *Pulp wastes, *Biological treatment, *Waste water treatment, *Activated sludge, Biochemical oxygen demand, Fermentation, Biodegradation, Microbiology, Microorganisms, Effluents, Pulp and paper industry, Sludge, Bleaching wastes, *Canada.
Identifiers: *Kraft mills, Kraft pulping, Process variables, Continuous process, Batch process, *British Columbia.

The microbiological treatment of effluents from a bleached kraft pulp mill requires acclimation of the inoculum. Even modest changes in biochemical oxygen demand result in major losses of acclimated sludge solids. Similar effects were not evident in the conventional five-day BOD test, owing to effluent dilution. For a bleached kraft mill effluent, the five-day BOD was found to measure only 0.84% of the thirty-day BOD. Batchwise and continuous fermentations of effluents from various coastal and inland kraft mills in British Columbia were conducted in order to elaborate various process paramenters of a low-rate activated sludge process with 24-hr detention time. Disperse sludge growth, albeit highly active, was observed with some effluents from an inland mill. However, this may be attributable to the individual samples examined, rather than to the low-rate 24-hr detention system. (Brown-IPC)
W73-12551

ADVANCED POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY.
Organization for Economic Co-Operation and Development, Paris (France).

Document No. 86020, 1972. 223 p, 3 fig, 5 tab, 15 annexes.

Descriptors: *Pulp and paper industry, Water pollution, *Pollution abatement, Technology, *Economic feasibility, Water pollution treatment, Air pollution, Economic impact, Economic efficiency, Costs, Economic impact, Water reuse, *Waste water treatment, Pulp wastes, Bleaching wastes, Oxygen, Industrial wastes, Effluents, Color, Research and development, Sulfur compounds, Chlorine compounds, Water conservation, Foreign research, Pollutants, Waste water (Pollution).
Identifiers: *Bleaching, *Pulping, Sulfite pulping, Kraft pulping, Pulp washing, Counter-current processes, Chemical pulping, Oxygen bleaching, Mechanical pulping, Newsprint.

An international study by OECD experts on paper industry water and air pollution problems and control technologies arrived at the following major conclusions: Presently accepted in-plant techniques can cut pollution loads in older pulp and paper mills by about 50%. External treatments can decrease effluent pollution loads by 75 to 90%. A 90% reduction of wastes may add $7 to $9 to the cost per ton of bleached kraft pulp. Current efforts to develop pulping and bleaching processes without use of sulfur and chlorine compounds should eliminate odorous air emissions, reduce water consumption, and permit recycling of bleaching effluent. The oxygen bleaching process holds particular promise for controlling effluent color. Improved mechanical (groundwood) pulping methods, while conserving raw material, can minimize the need for chemical pulps in newsprint furnishes. Water requirements and pollution loads are being reduced also by use of countercurrent washing techniques. These and other innovations will require significant research and development expenditures by the paper industry. Their impacts should become felt within 15-20 years. The color removal problem may be solved within a decade. Detailed evaluations are presented of various laboratory and pilot stage approaches with regard to commercial feasibility and economic and environmental implications. (Brown-IPC)
W73-12552

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from Institute of Paper Chemistry, Appleton, Wis., ($15.00). Bibliographic Series, No. 251, 1972. 127 p, 503 ref.

Descriptors: *Water pollution, *Pulp and paper industry, *Bibliographies, Legislation, Pollution abatement, Conferences, Surveys, Pulp wastes, Industrial wastes, Waste waters, Water conservation, Industrial water, Effluents, Design, Operation and maintenance, Technology, Waste water treatment.
Identifiers: Process modifications.

This is the first of a series of six annotated and indexed bibliographies. It deals with federal and state antipollution legislation, general survey and review articles, monographs, and conferences on water pollution in the paper industry, as well as with such changes in pulp and paper mill design and operating technologies that will reduce the volume of discharged aqueous effluents. The publications quoted span the time period from about 1950 to 1970. (See W73-12554 thru W73-12558) (Brown-IPC)
W73-12553

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. II. TESTING METHODS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05A.
W73-12554

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. III. STREAM RESPONSE,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05C.
W73-12555

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wis., ($15.00). Bibliographic Series, No 254, 1972. 159 p, 502 ref

Descriptors: *Water pollution, *Pulp and paper industry, *Water pollution treatment, *Physical control, *Bibliographies, Coagulation, Filtration, Flotation, Evaporation, Ion exchange, Adsorption, Crystallization, Operations, Sludge, Dewatering, Disposal, Waste disposal, Waste waters, *Waste water treatment, Pulp wastes, Industrial wastes, Ultimate disposal, Effluents, Treatment, Pollution abatement.
Identifiers: Concentrating.

This is the fourth part of a six-part annotated and indexed bibliography covering the pertinent literature published between about 1950 and 1970. It cites references to waste water and industrial effluent treatment by sedimentation, coagulation, filtration, flotation, adsorption, general and specific concentration processes, and related physical methods. The characteristics, dewatering, and ultimate disposal of sludges produced are also dealt with. (See also W73-12553) (Brown-IPC)
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wisconsin. ($17.00). Bibliographic Series, No 255, 1972. 203 p, 584 ref.

Descriptors: *Water pollution, *Water pollution treatment, *Bibliographies, *Pulp and paper industry, *Biological treatment, Activated sludge, Aerobic treatment, Anaerobic digestion, Biodegradation, Fermentation, Sewage treatment, Disposal, Ultimate disposal, Sludge, Industrial wastes, Waste disposal, Waste treatment, Deep wells, Diffusion, Pollution abatement, *Waste water treatment, Filtration, Lagoons, Soil disposal fields.
Identifiers: Diffusers.

This fifth in a series of six annotated and indexed bibliographies covering the literature published between about 1950 and 1970 deals with the treatment of paper industry waste waters by lagooning, biological filtration, aerobic and anaerobic digestion, fermentation, activated sludge processes, and combined biological purification schemes, including joint treatments with municipal sewage. Methods for the ultimate disposal of treated effluent residues on land, in deep wells, via diffusers, and by other means are also covered. (See also W73-12553) (Brown-IPC)
W73-12557

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. C. CHEMICAL PROCESSES, GENERAL OBSERVATIONS, AND REPORTS,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner, and L. Roth.
Available from the Institute of Paper Chemistry, Appleton, Wisconsin. ($12.00). Bibliographic Series, No. 256, 1972. 113 p, 362 ref.

Descriptors: *Water pollution, *Pulp and paper industry, *Bibliographies, *Chemcontrol, *Water pollution treatment, Neutralization, Oxidation, Reduction, Chemical reactions, Radiation, Byproducts, Waste waters, *Waste water treatment, Pulp wastes, Pollutants, Color, Toxicity, Incineration, Hydrogen ion concentration, Pollution abatement.
Identifiers: Combustion, Fluidized beds, Pyrolysis, Decoloration, Chemical recovery, Spent liquors.

This last part of a six-part annotated and indexed bibliography spanning the published literature period of 1950 to about 1970 is devoted to chemical methods for the treatment of paper industry waste waters and spent liquors. They cover combustion, fluidized-bed pyrolysis, pH control and neutralization, oxidation-reduction reactions, the use of nuclear radiations, and various special treatment methods. Also included are references to miscellaneous combined treatments of wastes for reduction of water pollution, removal of colored and toxic components, recovery of byproducts, and general observations excluded from the first five bibliographies. (See also W73-12553) (Brown-IPC)
W73-12558

ACTIVATED SLUDGE TREATMENT WITH OXYGEN,
Robert A. Taft Water Research Center, Cincinnati, Ohio.
J. B. Stamberg, D. F. Bishop, and G. Kumke.
Available from NTIS, Springfield, Va. 22151, as PB-214 564 Price $3.00 printed copy; $1.45 microfiche. Report, March 1971. 29 p, 6 fig, 5 tab.

Descriptors: *Waste water treatment, *Municipal wastes, *Activated sludge, *District of Columbia, Pilot plants, Research and Development, Methodology, Oxygenation, Sludge treatment, Solid wastes, Suspended solids, Aeration, Biochemical oxygen demand, Water quality control.
Identifiers: Solids retention time.

The Environmental Protection Agency Washington, D.C., Pilot Plant has been evaluating the oxygen-activated sludge treatment process since May 1970. An oxygen-activated system, consisting of a unique gastight biological reactor with less than 2.5 hours of aeration time and gravity clarification, produces effluents comparable in BOD and suspended solids to those of a parallel diffused aeration system with an aeration time of 3.6 hours. Consistently over 95% of the supplied oxygen was utilized in the reactor which employed co-current liquid and gas flow contacting. The mixed liquor suspended solids were maintained between 4,000 and 6,000 mg per liter. The mixed liquor increased to over 8,000 mg per liter when operated with alum addition for phosphorus removal. The underflow solids concentrations were between 1.0% and 1.4% without alum and 2.14% during the alum addition period. Visually, the microbial organisms were essentially the same as a typical conventional system; however, their rate of activity was greater above a solids retention time (SRT) of 6 days. The total production of solids was significantly less than the similarly operated diffused air system above an SRT of 6 days. As little as 0.35 lb of solids/lb of BOD was produced at an SRT of 13 days. Filamentous growth was observed below an SRT of 5 days, but not above. In warmer temperature periods, peak overflow rates of 1,940 gal per day per sq ft were observed. In the colder temperature periods, overflow rates of 975 gal per day per sq ft were the maximum obtained during the first year's operation. (Woodard-USGS)
W73-12586

TREATMENT OF SOYBEAN OIL SOAPSTOCK TO REDUCE POLLUTION,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
R. E. Beal, V. E. Sohns, and H. Menge.
J Am Oil Chem Soc. Vol 49, No 8, p 447-450. 1972.
Identifiers: Broiler feed, Pigmentation, Pollution, Soapstock, *Soybean oil, *Waste water treatment.

Often soapstock is acidulated to convert this byproduct of vegetable oil refining to a salable commodity. The acidic waste water from this treatment constituted a significant part of the environmental pollution from refineries. A process of neutralizing and drying was investigated as a nonpolluting method for upgrading soybean oil soapstock. Neutralization with sulfuric acid was conducted in a ribbon blender. The neutral soapstock was dired to 4% moisture, either batchwise in a natural circulation evaporator or continuously in a scraped film evaporator. The product is liquid while hot but solidifies to a waxy solid when cooled to room temperature. When added to a standard broiler ration, the feed efficiency and rate of gain of chickens equaled that obtained with a commercial feed fat added at the same level. The soapstock products feed, which contained 200-300 ppm xanthophyll, gave significantly better shank pigmentation than the commercial fat, which contained 3 ppm.--Copyright 1973, Biological Abstracts, Inc.
W73-12668

SELECTION OF A SUITABLE SYSTEM OF EFFLUENT PURIFICATION (O VYBORE RATSIONAL'NOI SISTEMY OCHISTKI STOCHNYKH VOD),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
M. A. Evilevich, and M. M. Nikiforov.
Bumazhnaya Promyshlennost, No 1, p 14-16, January 1972.

Descriptors: *Pulp wastes, *Waste water (Pollution), *Discharge (Water), *Legal aspects, Pulp and paper industry, Effluents, Treatment, Aeration, Biodegradation, Biochemical oxygen demand, Foreign countries, Water pollution control, Pollution abatement, Industrial wastes, Water pollution treatment, Pollutants, Discharge frequency, Toxicity, *Waste water treatment, Water quality control, Fish, Aquatic lire, Costs, Feasibility studies, Economic feasibility, Water pollution, Waste dilution, Water law, Stream pollution.
Identifiers: *Amur River, *Lignin, USSR.

Soviet government regulations for permissible discharges of pulp and paper mill effluents are criticized as unrealistic. Thus, the Amur River Mills may unload their waste waters only during six months of the year, and the five-day biochemical oxygen demand of discharged wastes must not exceed 2 mg per liter. This requirement could not be met, despite costly storage facilities, because of the slow biodegradation of alkali lignin. Even prolonged aeration will not reduce the five-day biochemical oxygen demand of kraft mill wastes below 5 to 6 mg per liter. Experimental evidence suggests this level to be harmless to water quality and to fish, particularly when additional purification is used to eliminate toxic constituents for which the biochemical oxygen demand is a poor indicator. Recommendations for realistic effluent treatments are made, depending on various feasible dilution factors and upon the dynamics of the receiving waters (flowing streams versus stagnant waters). (Stapinski-IPC)
W73-12673

ENCOURAGE APPLIED RESEARCH AND PUBLISH THE FINDINGS,
Minnesota Mining and Mfg. Co., St. Paul.
For primary bibliographic entry see Field 05G.
W73-12758

PETROLEUM...40 YEARS OF RESEARCH,
Secony Mobil Oil Co., Inc., New York.
For primary bibliographic entry see Field 03E.
W73-12768

SIGNIFICANCE OF HEATING AGRICULTURAL SOILS,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 03F.
W73-12802

REUSE OF HUMAN WASTES IN AGRICULTURE,
Asian Inst. of Tech., Bangkok (Thailand).
M. G. McGarry, S. M. A. Durrani, and W. Chuapohuck.
Thai J Agric Sci. Vol 5, No 3, p 183-194, 1972, Illus.
Identifiers: *Agriculture, Algae, Animals, Fish, *Human wastes, Reuse, *Wastes reuse.

More than 90% of materials used by man are wasted to the environment. Asian farmers recycled human and animal wastes on farms for centuries. Human excreta was a preferred fertilizer for vegetable and fish farming. The farmer effected increased yields at a lower cost and improved the urban environment through water pollution control. The uses, benefits, and health hazards resulting from human excreta on the farm are described. The Applied Scientific Research Corporation of Thailand and the Asian Institute of Technology jointly investigated the production of algae by using an open pond fed with sewage. The effluent was distributed to fish production ponds. The fish utilized the algae and other organisms in the treated waste water as a source of nutrients.--Copyright 1973, Biological Abstracts, Inc.
W73-12817

WPCF PROJECT REPORT: A STATE CERTIFICATION PROGRAM GUIDE,
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12842

CHARACTERIZATION OF CHEMICAL SLUDGES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W73-12871

ATP POOLS IN PURE AND MIXED CULTURES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W73-12887

MICROBIOLOGY IN THE AEROBIC TREATMENT OF FARM WASTE,
Reading Univ. (England).
J. M. Grainger.
Process Biochemistry, Vol 8, No 3, p 28-30, March 1973. 28 ref.

Descriptors: *Farm wastes, *Waste water treatment, *Isolation, *Microbial degradation, *Methodology, *Aerobic treatment, Protozoa, Waste disposal, Aerobic bacteria, Pathogenic bacteria, Microscopy, Slurries, Waste dilution, Reviews, Incubation, Sewage bacteria, Temperature, Pollutant identification.
Identifiers: *Enumeration, *Heterotrophic microorganisms, Culture media, Staining, Sample preparation, Homogenization, Inoculation, Agars, Vorticella.

Procedures are reviewed for the enumeration and isolation of heterotrophic microorganisms of aerobic systems for treatment of farm slurry. An introduction to the subject is presented based largely on accepted microbiological practice. Areas of consideration are microscopical procedures and isolation methods including handling of samples, dilution and homogenization, media composition, inoculation methods, and temperature and period of incubation. (Mortland-Battelle)
W73-12890

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: I. THE EFFECT ON YIELD, IN VIVO DIGESTIBILITY, AND CHEMICAL COMPOSITION OF COASTAL BERMUDAGRASS (CYNODON DACTYLON L. PERS.),
Guelph Univ. (Ontario). Dept. of Land Resource Science.
D. King, and H. D. Morris.
J Environ Qual. Vol 1, No 3, p 325-329, 1972, Illus.
Identifiers: Bacteria, *Bermuda grass, Chemical composition, Coliform, Cynodon-Dactylon, Digestibility, Disposal, Fertilizer, Grass, *Land disposal, Potassium, *Sewage sludge, Yield, Zinc, *Sludge disposal.

The disposal of liquid sewage sludge on established Coastal bermudagrass sod was studied over a 2-yr period. Rates of sludge application up to 20 cm/yr were compared with a conventional fertilizer treatment. In 1969 there were no significant differences among the 3 highest sludge rates

and all sludge rates were superior to chemical fertilizer (224n37-97 kg/ha NPK) in forage production. In 1970 no significant differences were found among the 3 top rates of sludge and a higher rate of chemical fertilizer (358-112-224 kg/ha NPK) that was used. Sludge applications had little effect on in vivo digestibility of the forage. The K level of the forage was initially increased by sludge applications but steadily declined during the last half of the 1969 season and the entire 1970 season. Sludge applications increased the N and Na level of the forage but had little or no effect on P, Ca, Mg, Mn, B, Cu, Mo, and Ni. Zn content of the forage increased with increasing sludge rate and number of application through the second clipping in 1970. Although Zn levels of 340 ppm were fouund no reduction in yield resulted. There was no significant survival of coliform bacteria on the forage at harvest. Coastal bermudagrass is a well-adapted crop for sludge disposal areas.--Copyright 1973, Biological Abstracts, Inc.
W73-12914

5E. Ultimate Disposal of Wastes

WATER QUALITY HYDROLOGY OF LANDS RECEIVING FARM ANIMAL WASTES,
Texas A and M Univ., College Station Water Resources Inst.
For primary bibliographic entry see Field 05B.
W73-12353

WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05D.
W73-12420

STUDY OF UTILIZATION AND DISPOSAL OF LIME SLUDGES CONTAINING PHOSPHATES,
Monsanto Research Corp., Dayton, Ohio. Dayton Lab.
For primary bibliographic entry see Field 05D.
W73-12501

GROUND WATER POLLUTION IN THE SOUTH CENTRAL STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Ground Water Research Program.
For primary bibliographic entry see Field 05B.
W73-12515

DEMOSTRATION OF A WASTE DISPOSAL SYSTEM FOR LIVESTOCK WASTE,
Moore Engineering, Inc., West Fargo, N. Dak.
For primary bibliographic entry see Field 05D.
W73-12517

METHODS FOR PULP AND PAPER MILL SLUDGE UTILIZATION AND DISPOSAL,
Crown Zellerbach Corp. Camas, Wash. Environmental Services Div.
T. R. Aspitarte, A. S. Rosenfeld, B. C. Smale, and H. R. Amberg.
Copy available from GPO Sup Doc as EP1.23/2 73-232, $2.10; microfiche from NTIS as PB-222 254, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-232, May 1973. 139 p, 34 fig, 45 tab, 6 ref. EPA Project 12040 ESV.

Descriptors: *Sludge disposal, *Soil treatment, Agriculture, Industrial wastes, *Pulp wastes, Sludge, *Wood wastes, Capital costs, Operating costs, *Incineration, Burning, Drying, *Crop production, Decomposing organic matter, Effluents, Odor, Phytotoxicity, Solid wastes, *Washington.
Identifiers: Cattle feed, Cattle bedding, Nematode control, Morel growth, Synthetic potting media, Camas (Wash).

The disposal of pulp and paper mill sludge in a manner which has minimal effect on the environment has become a serious problem. Four methods of disposal were evaluated, namely: (1) incineration in an air entrained dryer-incinerator, (2) burining in hog fuel boilers, (3) incorporation into soil as an amendment, and (4) hydromulching for soil stabilization. Other possible uses are discussed. Burning sludge in incinerators costs between $11 and $13/dry ton, including all prior dewatering steps. Sludge can be made available at various degrees of dewatering at costs of from $7 to $20/dry ton. Incorporation into farm soil offers the possibility for disposal of large quantities of sludge. At low levels (100-200 tons/acre) crop yields are satisfactory, provided adequate nitrogen is added. A high level incorporation (600 tons/acre) requires a year of fallow preceding crop planting. Sludge alone or in combination with bark can be used as a hydromulch in establishing grass stands on steep embankments. (EPA)
W73-12519

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12556

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. B. BIOLOGICAL SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12557

DELAWARE ESTUARY, PENNSYLVANIA, NEW JERSEY, AND DELAWARE, LONG-RANGE DREDGED SPOIL DISPOSAL PROBLEM.
Committee on Tidal Hydraulics (Army), Washington, D.C.

U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, May 1968. 28 p, 3 pl.

Descriptors: *Dredging, *Spoil banks, *Shoals, *Pennsylvania.
Identifiers: *Delaware Estuary, *Navigation channels, Marcus Hook (Penn).

A large part of recurring shoaling occurs in the vicinity of Marcus Hook, Pennsylvania. Both banks of the waterway in this locality are extensively developed, making the disposal area problem especially acute. Views of the Committee on Tidal Hydraulics are given on the following points: Sources of material in the Marcus Hook shoal; composition of Marcus Hook shoal; mechanics of deposition of the shoal at Marcus Hook; industrial use of water; correlation of volumes contributed and volumes of shoaling; beneficial use of materials in disposal areas; dehydration of disposal areas; and low density of effluent from dredge pumps. There will be no remaining capacity for disposal in a relatively short time if present procedures for dredging and disposal continue and if heavy shoaling continues in the reach. Discussion is given of possible measures to resolve the problem. These measures are: (a) Materially reduce contributions of shoaling material from the various sources; (b) Undertake works in the estuary that will cause transfer of most of the shoaling far downstream where disposal area capacity is available to meet the needs for many years; (c) Dredge the shoals in the critical reach, but transport the spoil by barge or pipeline to distant disposal areas. (Garrett-WES)
W73-12560

DISPOSAL OF DREDGE SPOIL; PROBLEM IDENTIFICATION AND ASSESSMENT AND RESEARCH PROGRAM DEVELOPMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W73-12573

SURVEY OF INDUSTRIAL WASTE INJECTION WELLS, VOLUME II,
Missouri Univ., Rolla. Dept. of Geological Engineering.
D. L. Warner.
Available from NTIS, Springfield, Va. 22151, as AD-756-642 Price $9.00 printed copy; $1.45 microfiche. Final Technical Rept, June 1972. 677p. USGS 14-01-001-12280.

Descriptors: *Waste disposal wells, *Disposal, *Injection wells, Louisiana, Michigan, New Mexico, Nevada, New York, North Carolina, Ohio, Oklahoma, Pennsylvania.

This report consists of 246 forms describing individual wastewater injection well that have been inventoried. A table (in Volume I) lists the 22 states in which wells are known to exist and the number of wells inventoried. The forms are grouped by state and arranged approximately chronologically within each state. All wells that have been constructed for injection of industrial wastewaters into saline water aquifers were included. In addition to operative wells, some of the wells in the survey have never been operated; others have been operated, but are now inactive or abandoned. Oil field brine injection wells are not included, nor are wells used exclusively for injection of sewage effluent. Volume II contains information for Louisiana, Michigan, New Mexico, Nevada, New York, North Carolina, Ohio, Oklahoma, and Pennsylvania. (See also W73-12051) (Knapp-USGS)
W73-12576

MAINTENANCE OF THE HUDSON RIVER CHANNEL, NEW YORK, NAVIGATION PROJECT, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08B.
W73-12588

AN EFFICIENT METHOD OF DEWATERING EFFLUENT SEDIMENTS (EFFEKTIVNYI SPOSOB OBEZVOZHIVANIYA OSADKOV STOCHNIKH VOD),
L. I. Shmidt, V. M. Shapchenko, V. V. Lobko, O. B. Makarov, and V. V. Irtegov.
Bumazhnaya Promyshlennost, No 2, p 14-15, February 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Sludge treatment, *Dewatering, Effluents, Pulp wastes, Pulp and paper industry, Biological treatment, Waste water treatment, Sediments, Pressure, Suspended solids, Coagulation, Chemcontrol, Storage, Reservoir storage, Freeze drying, Winter, Pressure, Flotation, Polymers, Waste disposal, Sludge disposal, Foreign research.
Identifiers: Compressed air, Aluminum compounds, Polyacrylamide, Kraft mills, USSR.

The aqueous effluents from the Baikal kraft pulp and paper mill are subjected to biological purification and subsequent coagulation with aluminum hydroxide sol. The resulting sediment comprises 13-14 percent of the effluent volume and contains 99.7-99.8 per cent water in addition to lignin, fibers, and coagulant solids. This sediment is transferred to a storage area and allowed to freeze in winter to reduce its volume by a factor of 40-50. Among various methods investigated for improving the dewatering efficiency, the most satisfactory results were obtained with pressure flotation of the kind widely used in the petroleum industry.

This process involves essentially the saturation of the sludge with compressed air, followed by sudden pressure release. The evolving air bubbles float the solid particles to the surface. In the pilot plant installation described, the application of air under 2 atm pressure was following by addition of polyacrylamide as coagulant in amounts of 3.1 to 0.5 mg per liter. This reduced the water content of the sediment by 95.1 to 95.7 per cent, while reducing the total sediment volume by a factor of 22 to 24. The liquid separated from the sludge contained only 2.7 to 6.0 mg of suspended solids per liter and could be disposed of without further treatment. (Stapinski-IPC)
W73-12674

PETROLEUM...40 YEARS OF RESEARCH,
Secony Mobil Oil Co., Inc., New York.
For primary bibliographic entry see Field 03E.
W73-12768

PROBLEMS OF GROUNDWATER POLLUTION BY BRINE,
Public Health Service, Dallas, Tex. Region VII.
For primary bibliographic entry see Field 05B.
W73-12770

WASTE DISPOSAL WELL PERFORMANCE,
Monsanto Biodize Systems, Inc., Great Neck, N.Y.
R. W. Payne.
Water and Wastes Engineering, Vol 7, No 7, p D-14 - D-18, July 1970. 4 fig, 7 ref.

Descriptors: Deep well disposal, *Injection wells, *Waste disposal wells, *Waste water disposal, Industrial wastes, Hydraulics, Permeability, Reservoirs.
Identifiers: *Injection horizon, *Semi-infinite aquifers, Intrained solids, Well development.

After a waste disposal well has been receiving water for a period of time, the injection pressures may be expected to rise. The wells performance must be analyzed to determine what fraction of the total increase is geologically inevitable so that the necessity and benefits of clean out or remedial work can be determined. Mathematical methods are presented for analyzing and predicting the changes in an industrial waste disposal wells pressure-rate relationship with time. Although these methods are widely used by the petroleum industry their applicability is relatively unknown to operators of industrial waste wells. Terms relating uniquely to the petroleum industry have been eliminated. Calculations based on long term performance of a Monsanto waste disposal well are used to evaluate the well work-over. A graphic solution is given for developing similar data for short-term shut-in tests. (Smith-NWWA)
W73-12779

THE DESIGN AND OPERATION OF DEEP--WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
B. T. Dean.
Journal Water Pollution Control Federation, Vol 37, No 2, p 245-254, February 1965. 7 fig, 2 tab.

Descriptors: Wells, *Injection wells, *Waste disposal wells, *Aquifer characteristics, Industrial wastes, Hydraulics, Recharge, *Artesian aquifer, Permeability, Cement grouting, Water pollution, Dissolved oxygen, Chemical oxygen demand, *Florida.
Identifiers: *Pensacola (Florida), *Well design, Salinity, Escambia River, Bio-oxidation waste treatment system, Liquid ion-exchange process.

Increased production of waste materials and the associated costs of surface disposal at the Pensacola, Florida plant of the Chemstrand Corp. caused management to seek new disposal techniques. In cooperation with the U.S. Geological Survey a high saline artesian aquifer at a depth of 1400 feet with a westward regional dip was chosen as a potential waste disposal zone. Upon the completion of test drilling it was determined by chemical and hydraulic analysis that the aquifer waters were compatible with the wastes and injection could be satisfactorily achieved. The disposal well system was completed, with modifications from the initial plan, to fit special conditions and the borehole was cemented from the barrier bed to the surface with the open portion completely intersecting the disposal zone. A shallow monitor well in an intermediate aquifer was completed to assure no vertical leakage from the pressurized disposal zone occurred. Subsequent operations have proven very acceptable and at present it appears that deep well disposal of aqueous wastes is an extremely satisfactory method because of its simplicity, finality and economy. (Smith-NWWA)
W73-12780

THE DISPOSAL OF WASTEWATER UNDERGROUND,
R. M. Winar.
Industrial Water Engineering, Vol 4, No 3, p 21-24, March 1967. 3 fig, 4 ref.

Descriptors: Wells, *Injection wells, *Waste disposal wells, Waste water disposal, *Underground storage, Water storage, Reservoirs, *Recharge, Permeability, Hydraulics, *Biochemical oxygen demand.
Identifiers: Salt cavities, Fracture zones, Hydraulic pressures, Chemical composition.

In recent years there has emerged an increasing awareness of the suitability of underground storage for wastes. Deep well injection into suitable aquifers as a prime method of industrial waste disposal has emerged from the slow, steady technological growth of the 1950s and has expanded rapidly in the last 10 years as indicated by the doubling of waste disposal wells between 1963 and 1966. Although 86% of the current disposal wells serve the chemical and refining industries, the great variety of effluents (brines, caustics, acids, plating liquors, chromates, cyanides, cooling waters, and a full range of organic-inorganic compounds) compatible with this disposal process indicates that many diverse industries i.e. metal fabricating, treating and plating, mining, paper and food processing will soon follow suit as the anti-pollution pressures of the public and government increase and the economics of this method become more and more favorable when compared to the costs of a surface treatment and disposal. (Smith-NWWA)
W73-12781

5F. Water Treatment and Quality Alteration

POSSIBILITIES OF WATER TREATMENT BY MEANS OF A MAGNETIC FIELD,
Glowny Instytut Gornictwa, Katowice (Poland).
For primary bibliographic entry see Field 05D.
W73-12481

CORROSION BY THE SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05G.
W73-12756

COMPARISON OF WATERFLOOD CORROSION DETECTION AND MONITORING DEVICES,
Atlantic Richfield Co., Bakersfield, Calif.
For primary bibliographic entry see Field 08G.
W73-12757

IMPACT OF WATER FLUORIDATION ON DENTAL PRACTICE AND DENTAL MANPOWER,
Illinois Univ., Chicago. Coll. of Dentistry.
B. L. Douglas, D. A. Wallace, M. Lerner, and S. B. Coppersmith.
J Am Dent Assoc. Vol 84, No 2, p 355-367, 1972.
Identifiers: *Dental practices, *Fluoridation, Manpower, Water supply, Potable water.

Dentists in F-deficient communities appear to be busier in their practices than dentists in fluoridated communities, who feel less overworked and spend more time on each patient. Dentists in fluoridated communities earned larger gross and net incomes in 1965, even with degree of specialization, effort, etc., held constant. The differential persisted, even though it was reduced in a 1967 income survey. Fluoridation appears to extend the existing pool of dental manpower to cover a substantially larger population.--Copyright 1973, Biological Abstracts, Inc.
W73-12816

VIRUSES IN METROPOLITAN WATERS: CONCENTRATION BY POLYELECTROLYTES, FREEZE CONCENTRATION, AND ULTRAFILTRATION,
Chicago Board of Health, Ill.
S. H. Rubenstein, J. Fenters, H. Orbach, N. Shuber, and J. Reed.
Journal of the American Water Works Association, Vol 65, No 3, p 200-202, March 1973. 4 tab, 6 ref.

Descriptors: *Viruses, *Methodology, *Lake Michigan, Cultures, Bacteria, Surface waters, Water analysis, Streptococcus, Pollutant identification.
Identifiers: Concentration, *Freeze concentration, *Polyelectrolytes, *Ultrafiltration, Natural waters, Recovery, Sample preparation, Culture media, Plaque assay, Collaborative studies, Coxsackie B4 virus, Echo 6 virus, Poliovirus 1-Sabin, Isobutylene maleic anhydride, *Chicago River (Ill).

A collaborative study was conducted to compare viral concentration methodologies and to elicit data related to the viral status of Lake Michigan. One laboratory employed a concentration method utilizing an insoluble cross-linked polyelectrolyte of isobutylene maleic anhydride (IMA). The second laboratory used a method of freeze-concentration and ultrafiltration. In both cases, experimental model systems, seeded with poliovirus and echovirus, were operated in the laboratory and actual samples form Lake Michigan filtration plants and the Chicago River were tested. The recovery and concentration of viruses were shown to be practical, simple, and efficient with either method. Both allow for the processing of large volumes of water with minimum manipulation and a high degree of certainty of viral recovery. In the testing of actual samples, no viral agents were detected in Lake Michigan samples and only one Echovirus isolate was yielded by Chicago River samples. (Mortland-Battelle)
W73-12867

FLUORIDATION OR FLUORIDE SUPPLEMENTS: A STATEMENT BY THE NUTRITION COMMITTEE, CANADIAN PAEDIATRIC SOCIETY.
For primary bibliographic entry see Field 05G.
W73-12990

5G. Water Quality Control

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W73-12351

CRITICAL REVIEW OF CURRENTLY AVAILABLE WATER QUALITY MODELS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 06A.
W73-12352

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-12354

REGIONAL SEWER SYSTEM, PLANNING AND COST ESTIMATION MODEL,
Regional Planning Council, Baltimore, Md.
A. G. Leary, and P. Zepp.
May 1968. 35 p, 2 fig, 4 tab, 1 append. HUD-Md.-P-61.

Descriptors: *Sewers, *Cost analysis, *Computer programs, *Model studies, Land use, Design criteria, Planning, *Maryland, Regional analysis, Regional development.
Identifiers: *Baltimore.

The purpose is to further develop a computer model to design and evaluate alternative sewer systems. The study expands an earlier report prepared for the Regional Planning Council by Alan M. Voorkees and Associates, Sewer System Cost Estimation Model. The key inputs to the model are the land use patterns to be served, the general physical layout of the sewer system, and some engineering design criteria. Principal outputs are various design data for specific sewer lines, unit costs, and total system costs. Model can be used to test the effect on costs of various land use patterns or plans and to determine the most efficient sewer system given a specific land use pattern. A short description of the computer model, flow diagrams of the computer program, and the results of a test problem are included. (Elfers - North Carolina)
W73-12357

COMPREHENSIVE PUBLIC WATER SUPPLY STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 03D.
W73-12358

SUMMARY REPORT: COMPREHENSIVE SEWERAGE STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.

June 1970. 24 p, 4 fig, 7 tab. N.Y. State Dept. of Health WPC-CS-176.

Descriptors: *Sewerage, *Planning, Projections, Cost analysis, Water quality, Coordination, *New York, *City planning.
Identifiers: *Schenectady County (New York), Mohawk River, Sewerage system expansion.

Two sections of Schenectady County, the eastern section including the Schenectady Metropolitan area and the rural-oriented western section are discussed. In the eastern section there have been several previous sewerage studies and this study brings together their findings within a broad perspective. Particular attention was placed on the effect on water quality of the Mohawk River from wastewater disposal and the question of whether each community in the metropolitan area should treat and dispose its own wastewater or handle it on a multimunicipal basis. In the western section it is recommended that individual disposal systems continue to be used except for three community centers where small collection and treatment systems are needed. Population and sewage flow projections, maps showing proposed system elements, and cost estimates for several alternative systems are included. (Elfers - North Carolina)
W73-12359

AN EVALUATION OF BALTIMORE HARBOR LAND USE POTENTIALS,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 06B.
W73-12361

INTERIM AREAWIDE WATER AND SEWER PLAN: BEL-O-MAR AREA.
Candeub, Fleissig and Associates, Newark, N.J.

Prepared for Bel-O-Mar Interstate Planning Commission, 1972. 56 p, 5 fig, 7 maps, 12 tab, 15 append. HUD West Virginia-84.

Descriptors: *Planning, *Water supply, *Sewerage, Land use, Environmental effects, Project planning, Administration, Coordination, *Ohio, *West Virginia, *Ohio River, *Interstate commissions, *Regional analysis.
Identifiers: Belmont County (Ohio), Ohio County (West Virginia), Marshall County (West Virginia).

Based on EPA and HUD requirements for areawide water and sewer plans, a planning framework and a short-range water and sewer project plan are presented for a three county area in Ohio and West Virginia. The most significant water resource in this area is the Ohio River, which is the primary water supply source and the receiving body of water for virtually all wastewater discharges. A detailed chart shows all significant intakes from and discharges into the river. Other topics include (1) the environmental impact of wastewater discharges; (2) existing water and sewer facilities; and (3) planning goals and objectives, existing land use patterns, and land use planning concepts. The short-range project plan is presented largely via tables listing specific projects and their costs and priorities. A long range policy plan on administration and financing also is presented. (Elfers - North Carolina)
W73-12362

SURVEY OF WATER TRANSPORTATION POTENTIAL TO REDUCE CONGESTION AND POLLUTION IN WASHINGTON, D.C. AND OTHER MAJOR CITIES.
Lulejian and Associates, Inc., Falls Church, Va.

Available from National Technical Information Service as COM-73-10253, $3.00 in paper copy, $1.45 in microfiche. Prepared for Department of Commerce, Maritime Administration, October 1972. 30 p, 20 fig. 2-36282 - Maritime Administration.

Descriptors: *Transportation, Navigation, Environmental effects, Economic feasibility, Hydrofoils, *Boats, Land use, Air pollution, *District of Columbia.
Identifiers: *Water transportation, Noise pollution.

The provision of transportation in large urban areas is increasingly becoming a major problem, especially in terms of efficiency and pollution. Water transportation offers a promising alternative because of the rapidly developing small boat technology, e.g. hydrofoils, and because most large cities are located on significant bodies of water. This alternative may also prove to be, as early studies indicate, better in terms of reduced noise levels and air pollution. This study focuses on Washington, D.C., and on the basis of travel patterns and various cost data, proposes and evaluates a water transportation system. Conclusions are: (1) such a system could be initiated in the near future, (2) it could be self-supporting, (3) it would have a minimal environmental impact, and (4) it would promote new commercial and recreational development along the waterways. (Elfers - North Carolina)
W73-12363

KAY COUNTY, OKLAHOMA, WATER AND SEWERAGE COMPREHENSIVE PLAN.
Evans and Nelson Engineering Co. and Associates, Ponca City, Okla.

Available from the National Technical Information Service as PB-213 565, $6.00 in paper copy, $1.45 in microfiche. Prepared for Office of Community Affairs and Planning, Oklahoma City, Oklahoma. June, 1972. 61 p, 28 fig, 10 tab. CPA-OK-06-56-1002.

Descriptors: *Water supply, *Sewerage, Rural areas, Data collections, *Oklahoma.
Identifiers: *Kay County (Okla), Inventories, Daw Dam (Okla), Kaw Reservoir (Okla).

Kay County in north central Oklahoma is rural with only a few small water and sewer systems. Groundwater is scarce except in areas adjacent to the Arkansas and Chickaskia Rivers. Impoundment of water in the Kaw Dam and Reservoir may provide water suitable for irrigation and industrial purposes and be a source of water supply for small communities. Basic data rather than plan and program formulation are presented as a first step in developing a water and sewer planning program for rural areas and cities under 5,000. Data include maps of existing water and sewer systems, maps of topography and soils, census data, political subdivision and land use maps, and descriptions of surface water and ground water resources in the county. (Elfers - North Carolina)
W73-12364

FUNCTIONAL WATER AND SEWERAGE PLAN AND PROGRAM, PEE DEE REGION, SOUTH CAROLINA.
LBC and W Associates, Columbia, S.C.

Available from the National Technical Information Service as PB-213 532, $10.25 in paper copy, $1.45 in microfiche. Prepared for Pee Dee Regional Planning and Development Council, Florence, South Carolina, May, 1972. 164 p, 31 ref. HUD-SC-04-00-0050 (g).

Descriptors: *Planning, *Water supply, *Sewerage, Urbanization, Land use, Comprehensive planning, Water demand, Environmental effects, Administration, Financing, *South Carolina, *Regional analysis.
Identifiers: Utility systems extension, *Pee Dee Region (South Carolina).

A continuing, comprehensive planning program concerned with facing problems of urbanization early before rapid urban growth occurs is being carried out by the Pee Dee Regional Planning and Development Council. The emphasis is not only one of providing adequate water and sewerage services, but also to plan these systems to help promote orderly patterns of growth. The study is closely related to population projections and land

ise planning and includes discussions of planning leterminants, goals and standards, environmental considerations, administration, and financial considerations. Each of the six counties in the region s analyzed separately for both water supply and sewerage systems. These analyses include an inventory of existing facilities, an analysis of water equirements and sewerage problems, and a proposed plan and program for water supply and sewerage. Analyses and plans are of a general nature due to the regional scope of the report and are argely based on previous planning and engineering studies made for individual jurisdictions. (Elers - North Carolina)
W73-12365

THE LAKEFRONT PLAN OF CHICAGO.
Chicago, Ill.
For primary bibliographic entry see Field 04C.
W73-12367

THE NIAGARA RIVER POLLUTION ABATEMENT PROGRESS - 1971.
Available from the National Technical Information Service as PB-213 683, $3.00 in paper copy, 1.45 in microfiche. International Joint Commission–United States and Canada, Summary Report, August 1971. 8 fig, 4 tab.

Descriptors: *Pollution abatement, *Water quality standards, *Comprehensive planning, New York, Canada, Water pollution control, Water pollution effects, Water pollution sources, International Joint Commission, Legislation, Regulation, Programs, Law enforcement, Monitoring, Financing, Grants, Planning, United States, Lake Erie, Lake Ontario, St. Lawrence River.
Identifiers: *Niagara River, Ontario (Canada).

Pollution abatement in the Niagara Area since 1967 has progressed so that it will ultimately be reflected by improved water quality in the Niagara River, however, total anticipated improvement will not be realized until all planned abatement measures are completed and operative. All New York municipalities are adding secondary and phosphorus removal facilities. New York industries that chose to provide their own waste control measures have made significant progress, although they have not always succeeded in meeting established completion schedules. Requirements of the Ontario Water Resource Commission have been met by most Canadian industries. Water quality of the Niagara River will be markedly improved by the cumulative effect of waste treatment and control measures underway by 1975. New York State programs in effect to abate pollution are enforcement, comprehensive sewage studies with implementation of a master plan, pure waters construction grants, incentive programs, surveillance, and legislative and administrative changes regarding boat pollution, phosphorus, thermal criteria, lateral sewer construction aid, pesticides, and bulk storage, transportation and handling of hazardous substances. The Province of Ontario control program includes assistance to municipalities, phosphorus control, enforcement and hearings, contingency planning for handling spills, marina and boating legislation, disposal of dredging spoil, herbicides and pesticides, and surveillance. (Jones-Wisconsin)
W73-12380

BUFFALO CREEK DAM DISASTER: WHY IT HAPPENED,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 04C.
W73-12411

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS.

Available from NTIS, Springfield, Va. 22151 as PB-213 880 - Price $6.00 printed copy; $1.45 microfiche. Environmental Protection Agency Publication, December 1971. 159 p.

Descriptors: *Water pollution sources, *Oil spills, *Chemicals, *Pollution abatement, Methodology, Transportation, Boats, Railroads, Highways, Water pollution control, Pollutants.
Identifiers: *Hazardous material spills.

More than two billion tons of potentially hazardous materials were produced and handled in the United States during 1968-1969. It is projected that the annual production quantities of these materials will approximate four billion tons in 1980. Over 70% of these quantities are transported by motor truck, railway, water barge, and pipeline. As long as the tonnage of liquid, solid and gaseous hazardous chemicals produced, handled, and transported by land and waterways continue to follow the present upward trend, the accidental spillage of these materials poses a real and growing threat of pollution to our water courses. Problems are discussed under the main topics: Hazardous Materials; Oil Spill Problem; Oil Characteristics; Oil Spill Prevention; Control and Treatment; and Legal Response. (Woodard-USGS)
W73-12427

VESSEL FOR THE REMOVAL OF OIL ON WATER,
S. Brydoy, and A. Sletsjoe.
U. S. Patent No. 3,737,040, 4 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 911, No 1, p 125, June 5, 1973.

Descriptors: *Patents, *Pollution abatement, Water quality control, *Oil pollution, *Oil spills, Skimming, Water pollution control, *Emulsifiers.
Identifiers: Barge-like vessels.

A vessel in the shape of a barge-like craft is used for carrying out both mechanical and chemical removal of oil from the surface of water. On each side of the intake section and extending in the normal direction of movement of the vessel, there are fastened sweeping arms which float on the water and direct the surface layer towards the intake. In the separation tank on board there is a skimmer for removal of floating oil. The skimmer is connected to a storage tank into which the oil may be pumped. Between the storage tank and the skimmer there may be inserted a container. The oil may then be pumped from the container to the storage minimizing the amount of air drawn into the pumping system. The dosaging device for the oil removing agent (emulsifier) is placed so that the agent may be sprayed or sprinkled down on the liquid. (Sinha-OEIS)
W73-12448

POLLUTANT RECOVERY SYSTEM,
J. J. Zerbe.
U.S. Patent No 3,734,294, 5 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1174, May 22, 1973.

Descriptors: *Patents, Flotsam, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Water pollution control, Water quality control, Adsorption.
Identifiers: Polyurethane, Sorbent material.

A linkage of floats or booms is used to surround the pollutant floating on the water surface. It is placed down-wind or down-current to confine the pollutant to a small recovery area. The pollutant is seeded with a particulate, floatable sorbent material, such as granulated or ground polyurethane. Two seeder units are tethered to a platform and are available to distribute the sorbent material. The recovery device consists of a rotatable support with scoops mounted on it. The scoops are porous - allowing water to pass through but retain the sorbent material and adsorbed pollutants. Collection trays are positioned to receive the contents of the scoops to facilitate discharge of the contents of the scoops. (Sinha-OEIS)
W73-12456

ELECTROSTATIC CROP SPRAYING,
Hong Kong Univ.
For primary bibliographic entry see Field 03F.
W73-12482

MEASURING AND DEVELOPING METHODS OF ATTITUDE AND MOTIVATIONAL CHANGE IN IMPLEMENTING THE BIG BLUE RIVER BASIN WATER PLAN,
Doane Coll., Crete, Nebr.
For primary bibliographic entry see Field 06B.
W73-12491

NUMERICAL THERMAL PLUME MODEL FOR VERTICAL OUTFALLS IN SHALLOW WATER,
Oregon State Univ., Corvallis. Dept. of Mechanical and Nuclear Engineering.
For primary bibliographic entry see Field 05B.
W73-12506

COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, T. L. Huntzinger, and G. V. Skogerboe.
Available from the National Technical Information Service as PB-222 280, $4.75 in paper copy, $1.45 in microfiche. Completion Report Series, Partial Report No 47, June 1973. 151 p, 24 fig, 21 tab, 23 ref. OWRR B-071-COLO (1).

Descriptors: Institutional constraints, Inter-basin transfer, *Mathematical models, *Optimization, Salinity, Urbanization, Waste water treatment, *Water quality, Water resources, Utah, *Water management (Applied), Model studies, *Cities, *Farm wastes.
Identifiers: *Utah Lake drainage area.

Like many other urbanizing river basins, the Utah Lake drainage area is faced with serious water quality degradation associated with expanding water use. While the region is not water-short, the downstream water users are encountering water deficiencies. To avoid aggravating these problems, water quality controls will be implemented in the Utah Lake drainage so that its future developments will not be harmfully reflected downstream. A model has been developed which optimized the allocation of water pollution abatement policies among agricultural and urban water uses. In addition, an analysis is made in which water quality management in areas surrounding Utah Lake is coordinated with the alternatives of lake diking and regional desalination. The results indicate that urbanization emphasizes control of urban pollution because of the inherent economies of scale in wastewater treatment facilities. On a basin-wide scale, desalting is the best strategy for future water quality management. (See also W73-12509 and W73-12510)
W73-12508

MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, and G. V. Skogerboe.
Available from the National Technical Information Service as PB-222 281, $4.50 in paper copy,

$1.45 in microfiche. Completion Report Series Partial Report No 45, June 1973. 119 p, 16 fig, 1 tab, 32 ref. OWRR B-071-COLO (2).

Descriptors: Institutional constraints, *Mathematical models, Optimization, Systems analysis, Urbanization, Waste water treatment, *Water management (Applied), *Water quality, *Water supply, Model studies, Cities, *Colorado, *Utah, *Optimal development plans, Farm wastes.
Identifiers: *Arid-urbanizing areas, Denver (Colo), Utah Lake drainage area.

Water management in arid urbanizing regions requires careful evaluation of the alternative strategies for supplying future demands and control of water quality. Mathematical models were formulated to study the interrelationships that exist among various institutional factors in order to delineate the requirements for implementing optimal policies. Two study areas were selected on which to test the utility of the models. Denver, Colorado, was chosen as an area representing conditions of water scarcity and increasingly stringent water quality standards. The Utah Lake drainage area in central Utah presented conditions where water quality management is necessary to insure the continued use of water in the downstream population center of the state. Together these models produce results useful in determining the optimal strategies for water management in arid urbanizing areas. (See also W73-12508)
W73-12509

EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, R. C. Ward, and G. V. Skogerboe.
Available from the National Technical Information Service as PB-222 282, $4.75 in paper copy, $1.45 in microfiche. Completion Report Series, Partial Report No 46, June 1973, 145 p, 30 fig, 1 tab, 34 ref. OWRR-B-071-COLO (3).

Descriptors: *Institutional constraints, Interbasin transfers, *Mathematical models, Optimization, Urbanization, Wastewater treatment, Water distribution systems, Water quality, Water resources, *Water reuse, Water treatment, *Colorado, *Cities, Model studies, *Optimal development plans, Water management (Applied).
Identifiers: *Denver (Colo).

A management level urban water system model has been developed to answer basic questions relating to optimal management of water in the urban environment. The model which coordinates water supply, distribution, and wastewater treatment is applied to the water management problems of the Denver, Colorado metropolitan area. Denver presently supplements diversions from the South Platte River with interbasin transfers, agricultural water right transfers, and groundwater. Although plans are being made to increase the capacity of these sources, increasingly stringent standards on wastewater effluents are enhancing the feasibility of reuse. In order to facilitate the implementation of optimal policies such as reuse, various institutional constraints must be evaluated. Certain of these including the legal interpretation of water rights, public opinions, management consolidation, and water quality control philosophies are explored. (See also W73-12508)
W73-12510

HERBICIDE CONTAMINATION OF SURFACE RUNOFF WATERS,
Utah State Univ., Logan. Dept. of Plant Science.
For primary bibliographic entry see Field 05B.
W73-12511

CONTROL OF MINE DRAINAGE FROM COAL MINE MINERAL WASTES - PHASE II - POLLUTION ABATEMENT AND MONITORING,
Consolidation Coal Co., Pinckneyville, Ill. Midwestern Div.
Z. V. Kosowski.
Copy available from GPO Sup Doc as EP1.23/2:73-230, $1.25; microfiche from NTIS as PB-222 252, $1.45. Environmental Protection Agency, Technology Seires Report, EPA-R2-73-230, May 1973. 83 p, 10 fig, 7 tab, 10 ref. EPA Project 14010 DDH.

Descriptors: *Mine drainage, Reclamation, Coal mines, *Illinois, Acid mine water, *Mine wastes, *Coal mine wastes, *Vegetation establishment, Erosion control, Air pollution, Water pollution control, Surries, Costs.
Identifiers: New Kathleen mine (Ill), Mineral wastes, Acid formation rate, *Refuse piles, *Slurry ponds.

Acid runoff from refuse piles can be controlled by covering the mineral wastes with soil, establishing a vegetative cover, and providing adequate drainage to minimize erosion. The average acid formation rate for the entire restored refuse pile was estimated at 16 lb acid as CaCO3/acre/day, or a reduction of 91+% when compared to the original unrestored pile. No significant differences were observed in acid formation rates from the 3 individual test plots covered with a nominal 1 foot, 2 feet, or 3 feet of soil. However, it was more difficult to physically place 1 foot of soil, especially on the steeper slopes. Slurry lagoons containing the fine coal rejects can be stabilized and the air pollution problem controlled by either a vegetative cover established directly on the mineral wastes without soil or by the application of a chemical stabilizer. Chemical stabilization is only a temporary measure, and vegetative covers should be the permanent solution to slurry lagoons. Cost data from this project indicate that it would cost approximately $6,100, $8,000, and $9,800 per acre to cover with grass a refuse pile with one, two, and three feet of soil respectively. (EPA)
W73-12516

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT,
Regional Science Research Inst., Philadelphia, Pa.
R. E. Coughlin, and T. R. Hammer.
Copy available from GPO Sup Doc as EP1.23/3 73-019, $2.60; microfiche from NTIS as PB-222 177, $1.45. Environmental Protection Agency, Socioeconomic Studies Series Report, EPA-R5-73-019, May 1973. 227 p, 17 fig, 46 tab, 66 ref. EPA Project 16110 DYX.

Descriptors: Appraisals, *City planning, Flood plain zoning, Regional analysis, Intangible benefits, *Land appraisals, Water quality, *Land use, *Urban areas, Environmental effects, Channel improvement.
Identifiers: Land use controls, Runoff pollution, Preference analysis, *Open spaces, Stream quality preservation.

The effects of a land use plan to restrict urban development in areas critical to the water resource system are identified through empirical studies. Specifically, relationships are established between amount, density, type, and location of urban development, on the one hand, and stream water quality and stream channel enlargement on the other. The amount of open space with such a plan as compared to that with normal development is determined. Perception of water quality by untrained observers in the field and its relationship to overall site preference is studied and pilot studies are reported concerning the preferences of a sample of observers for various landscape characteristics. The evaluation of these effects is approached through household surveys designed to determine how use of and preference for stream sites is related to water quality of stream and distance of residence from stream. In addition, the effect of preserved open space on adjacent land values is explored empirically. (EPA)
W73-12518

THE PROBLEM OF COLOR MEASUREMENT FOR PULP MANUFACTURING EFFLUENTS (LE PROBLEME DE LA MESURE DE COULEUR DES EFFLUENTS DE FABRICATION DES PATES),
Centre Technique de l'Industrie des Papeirs, Cartons et Celluloses, Grenoble (France).
C. Pierre, and D. Monzie.
ATIP Revue, Vol 26, No 2, p 115-120, 1972. 4 fig, 2 tab, 9 ref. (Association Technique de l'Industrie Papetiere).

Descriptors: *Pulp wastes, *Bleaching wastes, *Color, Colorimetry, Effluents, Testing procedures, Measurement, Foreign research, Pulp and paper industry, Europe.
Identifiers: Bleach plants, France.

A critical multilaboratory study was conducted of various reported methods for measuring the color of pulp mill and bleach plant effluents. The platinum-cobalt method of A. Hazen, originally published in 1892, is recommended with certain modifications as being better adaptable to the needs of the paper industry than is the tristimulus method developed in 1966 by the American Public Health Association. (Wise-IPC)
W73-12526

ONTARIO UNHAPPY WITH EFFORTS OF INDUSTRY TO HALT POLLUTION,
R. Starks.
Canadian Pulp and Paper Industry, Vol 25, No 3, p 13-15, March 1972. 3 fig.

Descriptors: *Law enforcement, *Pulp and paper industry, *Canada, *Pollution abatement, Water quality standards, Water pollution control, Air pollution, Legal aspects, Water law, Governments, State governments.
Identifiers: *Ontario.

In contrast with the progress made in air pollution control by the Ontario pulp and paper industry, the slow rate at which the province's pulp and paper mills are fighting water pollution is causing grave concern to the Ontario Water Resources Commission (OWRC). Existing pollution control installations are deemed inadequate, and further pressure by OWRC should be expected. Legal action has commenced against companies that have not yet complied with the government's water quality regulations. (Witt-IPC)
W73-12538

OPTIMUM CONDITIONS FOR THE DISCHARGE OF PAPER INDUSTRY EFFLUENTS (OPTIMAL'NOE VODOOTVEDENIE STOKOV BUMAZHNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
A. I. Shishkin, B. D. Korol'kov, and V. F. Maksimov.
Bumazhnaya Promyshlennost, No 4, p 14-15, April, 1972. 2 fig.

Descriptors: *Water pollution sources, *Industrial wastes, Streams, Rivers, Running waters, Pulp wastes, Textiles, Water quality, Water pollution, Waste waters (Pollution), Dissolved oxygen, Biochemical oxygen demand, Water analysis, Foreign countries, Settling basins, Discharge lines, Discharge (Water), Effluents, Surveys, Seasonal, Suspended solids, Self-purification, Waste dilution, Flow characteristics.
Identifiers: *Nara River (USSR).

1 km long stretch of the Nara River was surveyed in order to assess pollution loads contributed by the Serpukhov Paper Mill and by a synthetic textile fiber factory, as well as the seasonal self-purification capacity of the stream. Effluents were analyzed for discharge volumes, flow rates, chemical composition, and physical characteristics, as well as for downstream dilution. Dissolved oxygen did not vary greatly with flow rate, water temperature, or season, whereas the suspended solids content showed wide seasonal variations. The BOD was the most significant indicator of water quality and of self-purification. According to this criterion, the greatest source of pollution (37%) was the effluent from the horizontal sedimentation tank of the paper mill, followed by its second discharge outlet (29%) and by one of the textile factor's discharge pipes (22%). (Stapin-Witt-IPC)
W73-12547

VER THAMES ANTIPOLLUTION: BOARD-AKERS INSTALL WORLD'S LARGEST DAL RIVER SURFACE AERATOR.

orld's Paper Trade Review, Vol 177, No 9, p 2-283, March 2, 1972. 1 fig.

escriptors: Rivers, *Pulp wastes, *Aeration, quipment, Tidal streams, Oxygenation, ochemical oxygen demand, Waste water treatent, Pollution control, *Pollution control treatent, Pulp and paper industry, Surface waters, nning waters, Water quality control, Waste ters (Pollution), Port Authorities.
entifiers: *Board mills, *Thames River (U.K.), erators, United Kingdom.

cooperation with the Port of London Authority, arge 200-hp surface aerator has been installed by ames Board Mills, Ltd. near Purfleet to olenish the oxygen supply of the Thames River amounts equivalent to the biochemical oxygen mand of the board mill effluent discharged. A cond larger aerator of 300-hp capacity is also nned. (Witt-IPC)
73-12548

ERATION OF THE THAMES.

mpressed Air, Vol 77, No 5, p 12, (1972).

escriptors: *Aeration, Rivers, *Pulp wastes, quipment, Oxygen demand, Effluents, Treatent facilities, Water quality control, Waste ters (Pollution), Waste water treatment, *Pollun control treatment, Pollutants, Pollution conl, Running waters, Surface waters, Pulp and per industry, Tidal streams, Oxygenation.
entifiers: *Thames River (U.K.), *Board mills, ited Kingdom, *Aerators.

Purfleet, England, Thames Board Mills, Ltd. talled a 200-hp surface aerator in the River ames to compensate for the oxygen demands de on the stream by the discharged mill efents. A second aerator of 300-hp capacity is nned. (Witt-IPC)
73-12549

RGE SURFACE AERATOR DESIGNED TO NDITION BOARD MILL EFFLUENT.

xboard Containers, Vol 79, No 9, p 28, April, 72. 2 fig.

escriptors: Rivers, *Pulp wastes, *Aeration, quipment, Tidal streams, Oxygenation, ochemical oxygen demand, Surface waters, lp and paper industry, Effluents, Waste water atment, Pollution control, *Pollution control atment, Running waters, Waste waters (Pollun), Water quality control.
entifiers: *Board mills, *Thames River (U.K.), erators, United Kingdom.

A 'Simplex' cone aerator constructed by Ames Crosta Mills and Co. Ltd., Heywood, England, powered by a 200-hp motor, plus a second planned larger aerator of 300 hp, will permit the oxygen-consuming effluent load discharged by Thames Board Mills Ltd. to be fully compensated by reoxygenation of the Thames River. The 200-hp aerator is rated capable of dissolving 2.5 lb of oxygen per kw-hr. (Witt-IPC)
W73-12550

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN--PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
W73-12553

CALIFORNIA POWER PLANT SITING STUDY: VOLUMES, I, II, AND III.
Holmes and Narver, Inc., Anaheim, Calif.

Contract Report HN-8145.3-.5 (UC-12), May 1973. 466 p, 72 fig, 45 plate, 52 tab, 309 ref, 4 append.

Descriptors: *Powerplants, *California, *Environmental engineering, Nuclear powerplants, Underground powerplants, *Environmental effects, Social aspects, Thermal pollution, Water pollution control.
Identifiers: Offshore powerplants.

The concept of locating powerplants inland ranks highest in overall acceptability and would utilize land of greatest abundance in California. The concept consistently ranks high in acceptability when compared with other concepts against only cost, environmental impact, feasibility, or risk individually. Underground locations are not competitive with the acceptability of aboveground plants; but if they are preferred for aesthetics or for any of the other factors studied, the most favorable is one located in a cut-and-cover situation in nonmassive or poorly cemented materials. Offshore locations are not competitive with the acceptability of aboveground plants. The floating plant in a vessel located in deep water is more acceptable than the other offshore concepts because of its lower cost and the length of coastline where deep water exists. (Knapp-USGS)
W73-12574

ENVIRONMENTAL IMPACT STUDY.
Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.

Available from NTIS, Springfield, Virginia 22151, as AD-754 458 Price $10.60 printed copy; $1.45 microfiche. Final Technical Report 72-116, November 1972. 418 p, 7 fig, 22 tab, 15 ref, 6 append. ONR N00014-72-C-0425.

Descriptors: *Environmental control, *Pollution abatement, *Pollutant identification, *Water pollution sources, Air pollution, Analytical techniques, Instrumentation, Laboratory tests, On-site investigations, Mass - spectrometry, Polarographic analysis, Electrodes, Chromatography, Federal government, State governments, Administrative agencies.

The Advance Research Projects Agency (ARPA) Environmental Impact Program is directed toward identifying those scientific and technical areas necessary to achieve satisfactory evaluation and abatement of the environmental impacts of Department of Defense (DoD) activities. The effort is directed toward high technology problems for which there are current voids not being adequately addressed by others and for which the environmental evaluations require considerable interservice and interagency participation. Several areas were identified and appear to be germaine for additional efforts by DoD and ARPA. These include: sensors and instrumentation, critical materials, environmental impact prediction facility, model base, and environmental management. (Woodard-USGS)
W73-12580

REPORT TO THE FEDERAL WORKING GROUP ON PEST MANAGEMENT FROM THE TASK GROUP ON CATEGORIZATION OF PESTICIDES USED BY THE FEDERAL GOVERNMENT.
Federal Working Group on Pest Management, Rockville, Md.

Available from NTIS, Springfield, Va. 22151 as PB-214 385 - Price $3.00 printed copy; $1.45 microfiche. Report-72-1, September 1972. 36 p, 2 append.

Descriptors: *Pesticides, *Pest control, *Federal Government, Water pollution control, Acaricides, Fumigants, Fungicides, Herbicides, Insecticides, Molluscicides, Piscicides, Rodenticides, Pollutant identification.
Identifiers: *Pesticides categorization, Federal pest control programs, Pest management.

The report is designed for use of federal agencies which require the use of pesticides. The intent is to tie pesticide usage with the proper training of personnel using pesticides and appropriate professional review of pest management programs. The report is to be used in conjunction with the report to the Working Group from the Task Group on Training Objectives and Standards (FWGPM-72-2). Both reports are applicable to federal pest management programs only and are not intended as guidelines for public regulatory agencies or for regulatory decisions. Categorization is presented for 184 pesticides used by the federal government during 1970, 1971, and 1972. The four categories are described. Criteria used for the categorization as well as the levels of required training and review for each category are also presented. (Woodard-USGS)
W73-12598

HEALTH STANDARDS FOR METALS IN DRINKING WATER,
National Environmental Research Center, Cincinnati, Ohio.
R. G. Tardiff.
In: Heavy Metals in the Environment; Proceedings of Seminar conducted by Oregon State University, Corvallis, Fall Quarter 1972: Oregon State University Water Resources Research Institution Report SEMN WR 016.73, p 113-139, January 1973. 10 fig, 2 tab, 10 ref.

Descriptors: *Water quality standards, *Potable water, *Public health, *Water pollution effects, *Heavy metals, Water Quality Act, Water pollution control, Water quality control, Industrial wastes, Municipal wastes, Pesticides, Toxicity, Regulation, Water policy, Water properties, Trace elements, Federal Government.

The evaluation of hazards from chemicals in drinking water and the setting of standards for these compounds are under the legal jurisdiction of the Environmental Protection Agency. The actual development of standards for these agents is directed by the Office of Water Programs with assistance of experts both inside and outside of the Agency. The National Environmental Research Center of Cincinnati, Ohio, is the focal point for EPA-directed research on the health aspects of chemicals in drinking water. The standards presently in force for chemicals in potable water were promulgated by the U.S. Public Health Service in 1962. These standards are listed and are compared with the proposed standards as revised by the Environmental Protection Agency. In discussing the biologic data which must be evaluated to set standards, and in emphasizing the necessity of current research, mercury and its

derivatives are used as examples. (See also W73-12604) (WoodarddUSGS)
W73-12610

NUTRIENTS IN NEBRASKA'S WATERS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-12615

FOULING ON EELGRASS (ZOSTERA MARINA L.),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
J. McN. Sieburth, and C. D. Thomas.
Journal of Phycology, Vol 9, No 1, p 46-50, March 1973. 3 fig, 12 ref.

Descriptors: *Fouling, Diatoms, Marsh plants, Marine microorganisms, Marine plants, Marine algae, Chrysophyta, Electron microscopy, Salt marshes, Sampling, Rhodophyta, Fungi, Cyanophyta, Scuba diving, Marine bacteria.
Identifiers: *Cocconeis scutellum, Zoestera marina, *Colonization, *Eelgrass, Scanning electron microsopy, Macrophytes, Sample preparation, Spirulina.

The heavily fouled, immersed part of the blade, and the emersed portion of the blade undergoing fouling from mature, first-year plants collected by SCUBA from a brackish marsh were examined by scanning electron microscopy. The surface of young shoots emerging in the spring and the surface of mature blade tips immersed in the fall when examined at 500 to 2000x have a minimal scattering of coccoid and filamentous bacteria which are relatively insignificant in comparison to the colonization by pennate diatoms. Broken frustules and detritus adhere to form a crust which then becomes colonized nonselectively by a variety of microorganisms (stalked and colonial diatoms, filaments of red alga, a blue-green alga (Spirulina), a bacterium, and mycelia and sporangia of a fungus). Removal of the crust shows that the original 'cobblestone' surface of the eelgrass is obscured with a layer of deformed cells of Cocconeis scutellum which appears to be impressed into the epithelium. (Holoman-Battelle)
W73-12631

THE QUALITY OF DRAINAGE WATER FROM IRRIGATED BLACK COTTON SOILS FOR IRRIGATION,
University of Agricultural Sciences, Siruguppa (India). Agricultural Research Station.
For primary bibliographic entry see Field 03F.
W73-12650

INDICATORS OF ENVIRONMENTAL QUALITY. PROCEEDINGS OF A SYMPOSIUM.

Philadelphia, Pa., Dec. 26-31, 1971. Plenum Press: New York, N.Y., London, England. 1972. W. A. Thomas, editor, 275 p, Map. Illus. Pr. $18.50.
Identifiers: Books, *Environmental quality, *Indicators, Plants, Pollution, Proceedings, Symposium.

Indicators and indices which measure variables and provide overall composite values for environmental shifts are examined, emphasizing the importance of developing a common denominator with which to assess the environment. The first group of papers covers the following topics: indicators of environmental quality; use of environmental indices in policy formulation; urban-environmental indicators in municipal and neighborhood policy planning and decision making; the obligation of the scientist to explain environment to the public; and evaluation of natural environments. The next group of papers covers the following topics: establishing priorities among environmental stresses; pollutant burdens in humans-a measure of environmental quality; aquatic communities as indices of pollution; plants as indicators of air quality; biochemical indicators of environmental pollution; and use of sense of smell in determining environmental quality. The final group of papers includes the following topics: outdoor recreational resources and land use shift; a water quality index; indices of air quality; statistically based air-quality indices; indicators of environmental noise; developing a soil quality index; environmental indices for radioactivity releases; and plant indicators in ecology.--Copyright 1973, Biological Abstracts, Inc.
W73-12654

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION I,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
J. B. Berkowitz, G. R. Schimke, and V. R. Valerie.
Available from GPO, Washington, D.C. 20402, Price: Sect 1 as (EP1.23/2:73-179b) $1.25, Sect 2 as (EP1.23/2:73-179c) $7.25, Sect 3 as (EP1.23/2:73-179d) $3.70, Microfiche from NTIS as PB-222 248, $1.45 each. Environmental Protection Technology Series Report EPA-R2-73-179b-d, April 1973 (3 vol). EPA Contract 68-01-0102.

Descriptors: *Water pollution sources, *Industrial production, *Industrial wastes, *Indexing, Chemicals, Pollutants, Toxicity, Oxygen demand, Bibliographies, Environmental effects, Color, Odor, Eutrophication, Hardness (Water), Reviews, Water pollution control.
Identifiers: Manufactured products.

Data on the pollution potential of manufactured products are compiled in a catalog of three sections. These data are required for pollution control and for enforcement of environmental quality standards. Section I contains summary data consisting of product name, production rate, product lifetime, toxicity, oxygen demand, solids, color, odor eutrophication, oils and tars, and water hardness. Section II is a product listing. It summarizes, for each product, the chemical compositions of the product. Section III consists of a list of chemical ingredients of products, a bibliography, toxicity data, and oxygen demand data. (Knapp-USGS)
W73-12671-1

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION II, PRODUCT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
J. B. Berkowitz, G. R. Schimke, and V. R. Valerie.
Available from GPO, Washington, D.C. 20402, Price: Sect 1 as (EP1.23/2:73-179b) $1.25, Sect 2 as (EP1.23/2:73-179c) $7.25, Sect 3 as (EP1.23/2:73-179d) $3.70, Microfiche from NTIS as PB-222 249, $1.45. Environmental Protection Technology Series Report EPA-R2-73-179b-d, April 1973 (3 vol). EPA Contract 68-01-0102.

Descriptors: *Water pollution sources, *Industrial production, *Industrial wastes, *Indexing, Chemicals, Pollutants, Toxicity, Oxygen demand, Bibliographies, Environmental effects, Color, Odor, Eutrophication, Hardness (Water), Reviews, Water pollution control.
Identifiers: Manufactured products.

Data on the pollution potential of manufactured products are compiled in a catalog of three sections. These data are required for pollution control and for enforcement of environmental quality standards. Section I contains summary data consisting of product name, production rate, product lifetime, toxicity, oxygen demand, solids, color, odor, eutrophication, oils and tars, and water hardness. Section II is a product listing. It summarizes, for each product, the chemical compositions of the components of the product. Section III consists of a list of chemical ingredients of products, a bibliography, toxicity data, and oxygen demand data. (Knapp-USGS)
W73-12671-2

WATER POLLUTION POTENTIAL OF MANUFACTURED PRODUCTS--CATALOG SECTION III, CHEMICAL INGREDIENT LISTING,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
J. B. Berkowitz, G. R. Schimke, and V. R. Valerie.
Available from GPO, Washington, D.C. 20401, Price: Sect 1 as (EP1.23/2:73-179b) $1.25, Sect 2 as (EP1.23/2:73-179c) $7.25, Sect 3 as (EP1.23/2:73-179d) $3.70, Microfiche from NTIS as PB-222 250, $1.45. Environmental Protection Technology Series Report EPA-R2-73-179b-d, April 1973 (3 vol). EPA Contract 68-01-0102.

Descriptors: *Water pollution sources, *Industrial production, *Industrial wastes, *Indexing, Chemicals, Pollutants, Toxicity, Oxygen demand, Bibliographies, Environmental effects, Color, Odor, Eutrophication, Hardness (Water), Reviews, Water pollution control.
Identifiers: Manufactured products.

Data on the pollution potential of manufactured products are compiled in a catalog of three sections. These data are required for pollution control and for enforcement of environmental quality standards. Section I contains summary data consisting of product name, production rate, product lifetime, toxicity, oxygen demand, solids, color, odor, eutrophication, oils and tars, and water hardness. Section II is a product listing. It summarizes, for each product, the chemical compositions of the components of the product. Section III consists of a list of chemical ingredients of products, a bibliography, toxicity data, and oxygen demand data. (Knapp-USGS)
W73-12671-3

PROBLEMS OF ENVIRONMENTAL ECONOMICS.
For primary bibliographic entry see Field 06B.
W73-12675

ANTI-POLLUTION POLICY AND COST ALLOCATION: THE ISSUES IN PRACTICE,
Padua Univ. (Italy).
For primary bibliographic entry see Field 06B.
W73-12677

NOTES ON INFORMATION AND ADMINISTRATIVE COSTS IN THE THEORY OF EXTERNALITIES,
Queen Mary Coll., London (England). Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-12678

PETER BOHM.
Handelshogskolan i Stockholm (Sweden).
For primary bibliographic entry see Field 06B.
W73-12680

SOME LIMITATIONS OF BENEFIT-COST ANALYSIS IN RESPECT OF PROGRAMME WITH ENVIRONMENTAL CONSEQUENCES,
London Univ., (England). Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-12682

OUTLINE OF A MACRO-ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION: MULTI-SECTORAL APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 06B.
W73-12683

EVALUATION OF THE ECONOMIC EFFECTS OF ANTI-POLLUTION PUBLIC POLICY,
For primary bibliographic entry see Field 06B.
W73-12684

ECONOMIC EFFECTS OF TECHNOLOGY CHANGES IN RELATION TO THE ENVIRONMENT,
Bari Univ. (Italy). Instituto di Merceologia.
For primary bibliographic entry see Field 06B.
W73-12685

THE ROLE OF UNIFORM STANDARDS IN INTERNATIONAL ENVIRONMENTAL MANAGEMENT.
Maryland Univ., College Park. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 06B.
W73-12686

ENVIRONMENTAL COST OF MINING,
Bureau of Mines, Washington, D.C.
James E. Gilley.
In: Proceedings of the Council of Economics, American Institute of Mining, Metallurgical, and Petroleum Engineers, March 1-4, 1971, New York, p 99-109. 1 tab, 14 ref.

Descriptors: *Pollution abatement, *Mining, *Environmental effects, Costs, Water pollution control, Land subsidence, Mine drainage, Land reclamation, Acid mine water, Spoil banks, *Cost analysis, Estimated costs, Applachian Mountain Region.
Identifiers: Underground mining, Tailings, Coal fires, Cost effectiveness, Surface mining.

The environmental effects of underground and surface mining, and mineral or solid fuel processing and costs of alternative remedies are identified. In mining operations surface subsidence results from maximal extraction in order to realize optimum profits and conserve mineral resources. Control of the more insidious social cost of fires in abandoned mines and in virgin coal deposits has been attempted on a cooperative basis. More costly pollution problems are acid water drainage and sedimentation which imposes high costs to water users and results in serious aesthetic degradation, diminished aquatic life, and a decline in waterbased recreational use. Control is not only costly, but of limited effectiveness. Costs of necessary rehabilitation range from $304 million for correcting stream pollution and adverse soil conditions to $1.2 billion for development of surface-mined lands for specialized uses. The accumulation of solid wastes associtated with resource processing is expected to continue at an accelerating rate as resource demands increase and the quality of remaining deposits declines. Research is being conducted to discover recycling methods for these wastes. (Weaver-Wisconsin)
W73-12687

ANTIPOLLUTION POLICIES, THEIR NATURE AND THEIR IMPACT ON CORPORATE PROFITS,
E. J. Stahr.
In: Economics of Pollution, New York University Press, New York, New York, p 81-136, 1971. 2 tab.

Descriptors: Economics, *Economic impact, *Environment, *Costs, Standards, Economic efficiency, *Pollution taxes (Charges), Industries, Cities, Effluents, Constraints, Water quality standards.
Identifiers: *Environmental pollution control, Antipollution charges, Economic incentives.

The problem of optimal environmental pollution control policy is generally discussed through consideration and criticism of public opinions and presentation of opinions following from economic principles. The nature of the pollution problem is shown to be one of 'ecosystem overload' due to increasing industrial production and world population, the introduction of 'exotic' materials into the environment, and the growing expectations of cleanliness, safety, and healthfulness by society. Antipollution policy should be based upon three principles: (1) elimination of polluting goods through technological change or social policy, (2) consideration of the economic efficiency of environmental programs, and (3) the establishment of environmental standards. The central conclusion suggests that economic incentives be introduced to pollution control programs. The impact of such policy on the domestic economy and international trade is generally discussed. The implications of the cost of environmental protection from pesticides is briefly reviewed. (Weaver-Wisconsin)
W73-12695

IDENTIFICATION AND ACHIEVEMENT OF ENVIRONMENTAL QUALITY LEVELS IN MANAGING THE USE OF NATURAL RESOURCES,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Iowa Agriculture and Home Economics Experiment Station, Ames, Journal Paper No. J-7157, 1972. 29 p, 8 ref. OWRR B-015-IA (3)

Descriptors: *Water quality standards, *Management, *Cost transfer, Water policy, Decision making, Diseconomies of scale, Water reuse, Cost analysis, Methodology, Cost comparisons, Linear programming, Natural resources, Model studies, Cost allocations, Institutions.
Identifiers: *Environmental quality, *Least-cost analysis, *Next-use approach, Irreversible use.

Procedures for the identification, measurement, analysis, and achievement of environmental quality levels through natural resource management in the context of ecological, technological, and economic interrelationships are suggested. The next-use approach to the establishment of environmental quality levels given other social objectives was found preferable to the irreversibility approach. The next-use approach provided greater flexibility in the formulation of policy tailored for specific situations. Application of this approach is illustrated by two case studies in which least-cost estimates of achieving successively higher quality standards were obtained using linear programming. First-use effects on quality and next-use quality requirements were compared to derive the cost of alternative methods of raising the quality standards. Choice among these alternatives involves identifying the least-cost alternative given the provision of goods and services demanded by society. In addition, issues and possibilities involved with the achievement of a particular quality level in the context of various interrelated technological, economic and institutional considerations are briefly discusses. (Weaver-Wisconsin)
W73-12696

NOTE ON CHARGES AND BRIBES IN THE LONG RUN WITHIN WATERSHEDS,
Wyoming Univ., Laramie. Coll. of Commerce and Industry.
L. C. Maxwell.
Water Resources Research, Vol 8, No 5, p 1344-1346, 1972. 1 fig, 4 ref.

Descriptors: *Pollution abatement, *Pollution taxes (Charges), *Graphical analysis, Industries, Industrial wastes, Watersheds, Productivity, Economic efficiency, Economies of scale.
Identifiers: *Waste emission control, Long-run equilibrium.

How the impact of charges and bribes on long run levels of waste discharge and firm output for industries which are located in different watersheds and are characterized by increasing or decreasing costs was investigated. Kneese and Bower (1968) have demonstrated that the long run effect of charges and bribes was a symmetric reduction of waste emissions. The conclusion is that the impact of such charges and bribes is indeterminate. Based on the usual Marshallian conditions for long run equilibrium of firms and industries with the simplifying assumption that waste emission can be reduced only if the output of the firm is reduced, charges on waste emissions from a decreasing cost industry result in a decline in the production of both the representative firm and the industry; this impact is less severe in the case of a constant cost industry. The impact of such charges or bribes within any one watershed is indeterminate due to changes in emission which might occur in low damage watersheds, possible external resource price changes or insufficient a priori knowledge, as in the case in which abatement equipment is employed. (Weaver-Wisconsin)
W73-12702

CONSTRUCTION COSTS OF WATER SUPPLY AND SEWAGE NETWORKS IN POLAND--19-61-1970,
Institute of Public Utility Services, Warsaw (Poland).
For primary bibliographic entry see Field 06C.
W73-12703

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART I - EXECUTIVE SUMMARY.

Available from the National Technical Information Service as PB-211 917, $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C., July 1972. 16 p.

Descriptors: Costs, *Pollution abatement, *Cost analysis, *Economic impact, Financial feasibility, Air pollution, Water pollution control, Water quality standards, Industrial wastes, Pollution taxes (Charges).
Identifiers: *Steel industry, Capital expenditures, Foreign competition.

This volume summarizes findings and conclusions presented in Part II - The Structure of the Steel Industry and Part III - The Economic Impact of Pollution Abatement. The industry's output is highly concentrated among a small number of companies. Although demand for steel is highly sensitive to changes in the level of economic activity, steel prices have remained rigid in an upward direction. Lagging demand and increasing foreign competition have encouraged a breakdown in price leadership and increasing price shading. Stagnating demand resulted in falling profits which were stabilized in 1971 through price increases, improved productivity and management belt tightening. Voluntary restraint arrangements with foreign competitors have limited the increase of most types of steel imports. The potential impact of pollution abatement costs on the industry is dependent on many interacting and uncertain factors. However, subject to possible accelerated capital expenditures to replace plant and equipment which cannot be economically cleaned up, financing pollution abatement capital expenditures should be possible if the industry's profit performance parallels that projected in this study. (Weaver-Wisconsin)
W73-12707

IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART I. THE IMPACT OF ENVIRONMENTAL CONTROL COSTS.
Sobotka (Stephen) and Co., New York.

Available from the National Technical Information Service as PB 207 199, $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. 59 p, November 1971. 2 tab., 9 exhibits.

Descriptors: *Pollution abatement, *Economic impact, *Oil industry, Costs, *Cost analysis, Cost trends, Financial feasibility, Capital costs, Construction costs, Equipment, Unemployment, Pricing, Effluents, Air pollution, Water quality standards, Industrial wastes, Pollution taxes (Charges).
Identifiers: *Refineries.

Analysis of cost and price effects of environmental pollution control bases upon cost data furnished by the Environmental Protection Agency leads to the following conclusions: Oil product price increases of about 8 cents per barrel resulting from installation and operation of new equipment and most importantly from substitution of low for high sulphur liquid refinery fuel. New control equipment will cost the industry $113 million. New control equipment installed in existing refineries has a higher cost per barrel of capacity than equipment installed during new refinery construction. Due to increasing demand, the absence of substitute products, and foreign competition, as well as a small price elasticity for most of the industry's products, the cost of control equipment will be substantially recovered through increased product prices. Refineries will be affected depending on their current effluent control facilities, size, and oil refining processes. Refineries below 25,000 barrels per day capacity may be unable to finance control facilities due to large control costs relative to their going concern value. These refineries account for less than 1% of industry capacity and employ less than 1,000 people. (Weaver-Wisconsin)
W73-12708

A DESCRIPTIVE ANALYSIS OF THE BAKERY PRODUCTS INDUSTRY DETAILING INDUSTRY TRENDS AND CHARACTERISTICS RELEVANT TO ECONOMIC IMPACT ANALYSIS OF ENVIRONMENTAL STANDARDS. PART II.
Ernst and Ernst, Washington, D.C.

Available from the National Technical Information Service as PB-207 170, $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. December 1971. 18 p, 3 fig., 4 tab.

Descriptors: *Economic impact, *Cost analysis, *Pollution abatement, Marketing, Industrial plants, Cost trends, Competition, Demand, Water quality standards, *Pollution taxes (Charges), Industrial wastes.
Identifiers: *Bakery industry, Industry trends, Industrial organization.

The structure, characteristics and trends of the bakery industry relevant to the economic analysis of the impact of pollution abatement costs are described. The market for bakery products and, thus, location of bakeries is a strict function of population and is subject to only insignificant variations due to regional preferences. Thus, cost increases associated with pollution abatement will be spread uniformly over regions, given uniform cost increases across all regions. The demand for bakery products has been highly inelastic. Despite a growing trend toward concentration in the bakery industry, there remain a large number of firms whose competitiveness has resulted in low profit margins. In addition, low-technology plants do not typically operate at a cost disadvantage. Thus, cost increase due to pollution abatement will have an unbiased impact on plants of various sizes. Government influence on supply of bakery products is minimal. There exists sufficient overcapacity to correct for possible losses in supply due to plants leaving the industry. (See also W73-12710) (Weaver-Wisconsin)
W73-12709

A STUDY OF THE IMPACT OF POLLUTION STANDARDS AND CHARGES ON THE BAKERY INDUSTRY. PART III.
Ernst and Ernst, Washington D.C.

Available from the National Technical Information Service as PB-207 171, $3.75, in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. December 1971. 36 p, 3 tab, 2 append.

Descriptors: *Pollution abatement, *Economic impact, *Cost analysis, Industrial water, Industrial production, Cost trends, Financial feasibility, Water quality standards, *Pollution taxes (Charges), Industrial wastes.
Identifiers: *Bakery industry, Profit trends.

The preliminary findings of Part II of this study are amplified. The most relevant segmentation of the bakery industry is into (1) the bread, cake, and related products industry and (2) the biscuit and cracker industry. Within these two segments plants should be classified by size and amount of waste water discharged. Current trends in return on investment, employment, and concentration are expected to be unaffected by the small increases in cost due to pollution abatement activities. Using a cost model for pollution control in the bakery industry supplied by the Environmental Protection Agency, the probable impact of pollution control costs was found to be very insignificant. Annual abatement costs expected in the most expensive year (1976) were estimated by EPA to be $4.84 million. According to U.S. Department of Commerce data industry sales in 1976 are estimated as $9 billion. Thus, pollution abatement would raise costs .054 cents per dollar of sales, given current price trends. (See also W73-12709) (Weaver-Wisconsin)
W73-12710

MATHEMATICAL MODELING FOR ENVIRONMENTAL POLLUTION CONTROL,
Clemson Univ., S.C.
B. C. Dysart, III.
Seminar presented to: Southeast Water Laboratory, Environmental Protection Agency, Athens, Georgia, p 1-10, March 1972. 10 p, 1 fig. OWRR-B-017-SC (7).

Descriptors: *Water pollution control, *Environment, *Mathematical models, *Optimization, Value, Efficiency.
Identifiers: Accuracy.

There seems to be considerable hesitancy and reluctance on the part of many people to use optimization, for several reasons. Also, there are many who utilize it when it is a grossly inappropriate choice of tool for the problem at hand. These two groups do not average out for the benefit of pollution control. Some of the reasons people claim for their reluctance to use the technique are discussed. They include: (1) Instream transfer functions and process models are not accurate enough to use with reliability--optimization techniques cannot be trusted in this sort of problem solving; (2) the problem or system is too complex to model; (3) since the chances of implementing an optimal policy are slim, why bother to find one; (4) the use of optimization results in too much dependence upon economics and not enough consideration for the pragmatic aspects of how to deal with the problem; and (5) common optimization techniques are not adequate when dealing with large systems with great precision and consideration of minute details. Optimization can be advantageous as tools for guiding planners in water resources development, but professionals must decide realistically just what they want from mathematical modeling in general. (Bell-Cornell)
W73-12711

EVALUATION OF HERBICIDES FOR SUBMERGED WEEDS IN CHAMBAL AND BHAKRA-NANGAL CANAL SYSTEMS,
Indian Grassland and Fodder Research Inst., Jhansi. Div. of Weed Ecology Control.
T. R. Dutta, J. Prasad, and R. P. Singh.
Indian J Agric Sci. Vol 42, No 1, p 70-75. 1972.
Identifiers: *Aquatic weed control, Berseem, Canals, Ceratophyllum-Demersum, Chara-Vulgaris, Chlorothiamid, Coriander, Diuron, Endothal, Esters, *Herbicides, Hydrilla-Verticillata, *India, Linseed, Mustard, Najas-Minor, Potamogeton-Crispus, Potamogeton-Nodosus, Potamogeton-Pectinatus, Potamogeton-Perfoliatus, Rice, Vallisneria-Spiralis, Weeds, Wheat, Xylene.

Chlorothiamid, endothal (dipotassium and alkylamine), 2.4-D butoxyethanol ester, diuron and xylene were screened in situ on 25-m lengths of channels heavily infested with weeds at Kota and Jyotisar. The discharge capacity of these channels were seriously hampered by growth of Potamogeton perfoliatus L., P. pectinatus L., P. nodosus Poir., P. crispus L., Chara vulgaris Vals, Najas minor Rend., Hydrilla verticillata (L. f.) Royle, Ceratophyllum demersum L. and Vallisneria spiralis L. The experiments were conducted in both slow-flowing and stationary channels. Chlorothiamid, endothal and 2,4-D completely killed all the submerged weeds. The herbicides were more effective in stagnant than in flowing water. The treated water was found safe for linseed, mustard, gram, berseem, coriander, wheat and rice, which are the common crops of these regions. The herbicide-treated water was non-toxic for mammalian consumption.--Copyright 1973, Biological Abstracts, Inc.
W73-12738

EFFECTS OF PESTICIDES IN WATER--A REPORT TO THE STATES.
Environmental Protection Agency, Washington, D.C.

Available from the National Technical Information Service as PB-222 320, $5.75 in paper copy, $1.45 in microfiche. (1972). 85 p, 2 tab, 52 ref, append.

Descriptors: *Pesticides, *Water pollution effects, *Water pollution control, *Federal Water Pollution Control Act, State governments, Environmental effects, Economic impact, Social aspects, Pollution abatement, Watershed management, Water pollution sources, Reviews, Evaluation.

Current knowledge is presented of the effects on health and welfare of the presence of pesticides in water. This document is to serve as a guide to the States in carrying out the Federal Water Pollution Control Act. Some of the more important considerations are: the nature of the environmental effect of the presence of pesticides in water (e.g., long or short term, temporary or permanent, localized or widespread, etc.); the economic and social impact of the control measure, including both impact associated with restricting use of pesticides, and the impact of the environmental damage to be alleviated; the practicality and enforceability of the control measure, including the availability of techniques and instrumentation for determining whether particular standards are being met; and the availability of other control measures for meeting the objectives, and the relationship to and consistency of the control measure with policy and action under other programs. (Woodard-USGS)
W73-12752

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL 1 - CHEMISTRY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12753

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL II - BIOLOGY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12754

CORROSION BY THE SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
D. A. King, and J. D. A. Miller.
Nature, Vol 233, No 5320, p 491-492, October 15, 1971. 2 fig, 1 tab, 13 ref.

Descriptors: *Corrosion, Cathodic protection, Chemical reactions, *Sulfer bacteria, Anaerobic bacteria.
Identifiers: *Cathodic depolarization, Anodic reaction, *Corrosion cell, Oxygen-free conditions.

There are several explanations for the aggravation of corrosion of iron and steel in oxygen-free conditions by sulfate-reducing bacteria. These are (a) stimulation of the cathodic part of the corrosion cell by the removal and utilization of the polarizing hydrogen by the bacteria, (b) stimulation of the cathodic reaction by solid ferrous sulphides formed by the reaction of ferrous ions with sulphide ions produced by bacteria, (c) stimulation of the anodic reaction, metal dissolution, by bacterially produced sulphide, (d) local acid cell formation and (e) formation of iron phosphide by the reaction of the metal with bacterially reduced phosphates. A new theory of corrosion by the sulphate-reducing bacteria is proposed such that the cathodic reaction, hydrogren evolution, occurs on the ferrous sulphide produced by the reaction of ferrous ion with bacterially produced sulphide ion. The ferrous sulphide activity is diminished with time, but is restored by removal of the atomic hydrogen by bacterial hydrogenase activity. (Campbell-NWWA)
W73-12756

ENCOURAGE APPLIED RESEARCH AND PUBLISH THE FINDINGS,
Minnesota Mining and Mfg. Co., St. Paul.
T. T. Ling.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 92, No SA4, p 1-5, August 1966.

Descriptors: *Sanitary engineering, Waste water, Technology, *Engineering education, On-site investigations, Projects.
Identifiers: *Applied research, Federal Water Quality Act.

A number of engineers have indicated that most sanitary engineering research papers now being published are too 'academic'; findings cannot be directly applied to solve field engineering problems. In order to bridge this gap and provide a more balanced program that serves the academician as well as the field engineer, the scope of research must be enlarge to include more applied research. Due to the Federal Water Quality Act, information that can be used to solve various sanitary engineering problems is needed more than ever before; results obtained from applied research through the study of existing installations represent one of the best sources to fill this demand. Feasible means, such as the presentation of papers at national conferences, reimbursed if possible, are needed to encourage engineers, consulting firms, municipalities and various control agencies to participate in research and publish their findings. (Campbell-NWWA)
W73-12758

CATHODIC PROTECTION FOR COATED STEEL PIPELINES,
Colorado Springs Dept. of Public Works, Colo. Water Div.
For primary bibliographic entry see Field 08G.
W73-12765

CORROSION MONITORING METHOD REDUCES EFFECT OF VARIABLES IN ANALYZING OIL FIELD WATERS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
For primary bibliographic entry see Field 08G.
W73-12767

PITLESS UNITS AND ADAPTERS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 08G.
W73-12776

THE DESIGN AND OPERATION OF DEEP-WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
For primary bibliographic entry see Field 05E.
W73-12780

ECOLOGICAL INFORMATION ON THE DIFFERENCES IN THE NUMBER OF CULEX TRITAENIORHYNCHUS LARVAE AMONG PADDY FIELDS (IN JAPANESE),
Osaka Prefecture Inst. of Public Health (Japan).
For primary bibliographic entry see Field 03F.
W73-12829

ANNUAL LITERATURE REVIEW: ADMINISTRATION, SYSTEMS ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
D. P. Loucks.
Journal Water Pollution Control Federation, Annual Literature Review, Vol 45, No 6, p 1407-1414, June, 1973. 98 ref.

Descriptors: *Water pollution control, Waste water treatment, *Systems analysis, *Planning, *Decision making, *Management, Water quality, Simulation analysis, Optimization, Dynamic programming, Linear programming, Bibliographies, *Reviews.

The 1972 literature on the development and application of systems analysis techniques for defining and evaluating alternative water pollution control policies can be divided into state-of-the-art reviews, methodological studies, and applications of mathematical models to river, lake, or estuarine water quality control problems, to the analysis and design of sewer systems and waste water treatment facilities, and to particular problems in thermal pollution and industrial and agricultural effluent control. Forty-four such documents (books, articles, and reports) pertinent to the field of waste water treatment and water pollution control are summarized. The writings include a broad spectrum of mathematical modeling techniques, such as simulation analysis, linear and dynamic programming, and other optimization methods, to estimate feasible and often least-cost design and management alternatives for water quality planning. (Bell-Cornell)
W73-12840

WPCF PROJECT REPORT: A STATE CERTIFICATION PROGRAM GUIDE,
Water Pollution Control Federation, Washington, D.C.
L. L. Guy, Jr., G. W. Burke, Jr., and C. W. Brinck.
Journal Water Pollution Control Federation, Vol 45, No 5, p 787-808, May 1973. 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Administration, *Personnel, *Training, Operations, Classification, Education, Regulation, Water quality control, Water pollution control.
Identifiers: *Certification programs, Examination, Certification renewals, Certification criteria.

A study was conducted, supported by an EPA grant, of state programs for certification of operations personnel in wastewater facilities. Six states were visited and the others polled for facts and opinions on key issues. The project report included the findings and conclusions of the study and recommended actions for federal and state agencies. A 'State Certification Program Guide' is presented that attempts to describe the elements of an effective state program. The states are encouraged to coordinate their efforts, and particular attention is directed toward (a) adequate autonomy and budget, (b) separate certification from training, (c) broader coverage of personnel and facilities, (d) development of a sound classification system, (e) separate certification for industrial waste facilities, and (f) easier reciprocity among state programs. (Mortland-Battelle)
W73-12842

APPLICATION OF LIQUID CHROMATOGRAPHY TO POLLUTION ABATEMENT STUDIES OF MUNITION WASTES,
Army Natick Labs., Mass. Pioneering Research Lab.
For primary bibliographic entry see Field 05A.
W73-12877

PROPOSED OIL POLLUTION REGULATIONS, (FINAL ENVIRONMENTAL STATEMENT).
Coast Guard, Washington, D.C. Marine Environmental Protection Div.

Available from NTIS, Springfield, Va. 22151 as EIS-AA-73-0279-F - Price $3.00 printed copy; $1.45 microfiche. February 1973. 22 p.

Descriptors: *Coast Guard regulations, *Oil spills, *Oil industry, *Water pollution control, *Navigable waters, Navigation, Legal aspects, Transportation, Ships, Boats, Barges, Harbors, Inland waterways, Environmental control.
Identifiers: Transfer of oil, Environmental Impact Statements.

The U.S. Coast Guard, acting under the authority of the Federal Water Pollution Control Act, presents regulations governing the design, construction, and operation of vessels operating in the navigable waters and contiguous zone of the United States, and governing the design, construction, and operation of onshore and offshore facilities engaged in the transfer of oil in bulk (more than 250 barrels) to and from vessels. The purpose of these regulations is to reduce the probability of an accidental discharge of oil or oily wastes to or from vessels, or as a result of certain vessel accidents of limited energy. (Woodard-USGS)
W73-12955

MULTIPLE-USE PROBLEMS IN THE GREAT LAKES.
For primary bibliographic entry see Field 06B.
W73-12960

THE PLANNING VIEWPOINT,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06B.
W73-12964

AN INDUSTRIAL POINT OF VIEW-1970,
Wisconsin Electric Power Co., Milwaukee.
For primary bibliographic entry see Field 06B.
W73-12965

FLUORIDATION OR FLUORIDE SUPPLEMENTS: A STATEMENT BY THE NUTRITION

COMMITTEE, CANADIAN PAEDIATRIC SOCIETY.

Can Med Assoc J. Vol 106, No 2, p 150-153. 1972.
Identifiers: *Canada, *Fluoridation, Fluoride supplements, Human nutrition, Pediatric society, Water supply, *Potable water.

The following are recommended: all Canadian municipal water supplies should be adjusted to contain 0.7-1.0 ppm fluoride; where water supplies contain less than 0.5 ppm fluoride, fluoride supplements should be used, in conjunction with an education program to promote their regular use by all children under the age of 14; where water supplies contain more the 0.7 ppm fluoride, fluoride supplements should not be recommended.--Copyright 1973, Biological Abstracts, Inc.
W73-12990

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
G. W. Reid, and R. T. Alguire.
Available from the National Technical Information Service as PB-222 262, $6.00 in paper copy, $1.45 in microfiche. University of Oklahoma Research Institute Final Report, 1973, 401 p, 20 fig, 33 tab, 31 ref, 4 append. OWRR C-3263 (No 3709) (1).

Descriptors: *Systems analysis, *Cities, *Regional analysis, *Water distribution (Applied), *Sewers, *Planning, Land use, Demand, Network design, Model studies, Computer models, Cost analysis, Census, Human population, Water demand, *Oklahoma.

The objective was to provide the average planning group with a usable tool that would impart a systematic procedure for analyzing the water and sewerage networks of a regional metropolitan area. The framework derived for conducting this study was accomplished by the construction of six procedures which use three computer models: the inventory and data projection procedure which provides the input; the population model and procedure which generates the desirable alternatives in terms of people and their socio-economic characteristics; the land use procedure which allocates the output of the population model to an areal scheme; the demand model and procedure which produces the water demand and sewage output for the given areal scheme; the network model and procedure which optimizes on a least cost basis, while maximizing utilization of resources, the networks of water and sewerage to fulfill the alternatives available, and finally the plan procedures for the development of a continuing and comprehensive plan. The steps between each procedure have built-in planner intervention points, where the using group may 'game' new alternatives based on the results and data acquired from the previous procedure. The model was developed using data from the association of Central Oklahoma Governments.
W73-12351

CRITICAL REVIEW OF CURRENTLY AVAILABLE WATER QUALITY MODELS,
Hydrocomp, Inc., Palo Alto, Calif.
P. S. Lombardo.
Available from the National Technical Information Service as PB-222 265, $4.85 in paper copy, $1.45 in microfiche. Report, July 1973. 101 p., 5 fig., 5 tab, 62 ref, append. OWRR X-124 (No 3751) (1). OWRR 14-31-0001-3751.

Descriptors: *Water quality, *Model studies, *Reviews, Research priorities, *Simulation analysis, Management, Systems analysis, Input-output analysis, Data collections.

The state of the art of water quality modeling is reviewed and the six most comprehensive of the available models for simulating most water quality indices, including temperature, dissolved oxygen, BOD, nutrients, algae and zooplankton are evaluated. Models simulating only the DO-BOD relationship were considered to be inadequate for water quality management purposes and were not reviewed. Research needs for water quality model refinement are discussed. The importance of obtaining data adequate in quantity and detail for testing of models is stressed. Model application and analysis of model output are discussed. The Chen and Orlob model is felt to be the best present model for lake and estuarine analysis, and the Lombardo and Franz model appears to be the best available model for stream analysis.
W73-12352

MATHEMATICAL MODELS IN ECOLOGY, PROCEEDINGS OF THE 12TH SYMPOSIUM.
Grange-over-Sands, Lancashire, England, March 23-26, 1971. Blackwell Scientific Publications: Oxford, England; (Dist. in U.S.A. by F. A. Davis Co.). 1972. J. N. R. Jeffers, editor, 398 p, Illus. Map. Pr $21.00.
Identifiers: Books, *Ecology, *Mathematical models, Proceedings, Symposium, Computer models.

The papers presented represent the current state of the use of mathematical models in ecology and related sciences. The first group of papers cover the following topics: the challenge of mathematics to the ecologists; philosophical aspects of mathematical modelling in empirical science with special reference to ecology; developments in the Leslie matrix model; models and analysis of descriptive vegetation data; and theoretical models for large-scale vegetation survey. The next several papers cover the following topics: organization and management of an integrated ecological research program; building and testing ecosystem models; population models as a basis for pest control; an introduction to the analogue computer; parameter sensitivity and interdependence in hydrological models; and the use of computer simulation in conservation management. Papers are included on the following specific subjects: the simulation language as an aid to ecological modelling; stochastic model fitting by evolutionary operation; a field experiment, a small computer and model simulation; data management; and a discussion of the application of mathematical models to the assessment of the changes likely from the construction of an esturarine barrage. A section is included presenting a summary and assessment of the symposium from the point of view of a research director, an agricultural research scientist, a statistician and an ecologist. Numerous mathematical formulas are employed throughout, and each paper ends with a list of related references.--Copyright 1973, Biological Abstracts, Inc.
W73-12653

OUTLINE OF A MACRO-ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION: A MULTI-SECTORAL APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
For primary bibliographic entry see Field 06B.
W73-12683

EVALUATION OF THE ECONOMIC EFFECTS OF ANTI-POLLUTION PUBLIC POLICY,
For primary bibliographic entry see Field 06B.
W73-12684

VALUATION OF TIMBER, FORAGE AND WATER FROM NATIONAL FOREST LANDS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 06B.
W73-12701

MATHEMATICAL MODELING FOR ENVIRONMENTAL POLLUTION CONTROL,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05G.
W73-12711

THE DEVELOPMENT OF A REGIONAL SYSTEMS ORIENTED WATER MANAGEMENT MODEL: A TOOL FOR POLICY ANALYSIS,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
J. M. Richardson, Jr.
Technical Report, SRC Tech. Memo No 45, Rockefeller Paper-JMR-73-4, June 1, 1973. 33 p, 12 fig, 14 ref, 3 append.

Descriptors: *Water management (Applied), *Regional analysis, *Simulation analysis, *Planning, *Decision making, Water quality, *Political aspects, Water, Ecosystems, Phosphorous, Pollution abatement, Waste treatment, Governments, Computerprograms, Economics, Mathematical models, Systems analysis.

With the complexity of large social-technological-biological systems, the use of systems modeling and computer simulation techniques are believed to be necessary and highly potential for planning in the comprehensive field of water management. In order for a model to be useful to decision makers, it must meet two sets of potentially conflicting criteria: (a) Comprehensiveness and reliability; and (b) usability. Two submodels of a systems oriented regional water management model are discussed. The submodels, called PHIPAM (Phosphorus Interactive Policy Analysis Model) and IRRM (Institutional Regional Regulatory Model) are designed to simulate, respectively, an interactive decision stratum and the political aspects of local government planning and decision making in water management. They are specifically designed to strengthen the larger model of which they are a part in the problem areas of comprehensiveness and utility. PHIPAM and IRRM represent concrete attempts to bridge the gap between scientific validity and utility. With further development, it is hoped that they can contribute to the more effective utilization of systems models for policy analysis in the area of water management and elsewhere. (Bell-Cornell)
W73-12839

ANNUAL LITERATURE REVIEW: ADMINISTRATION, SYSTEMS ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
W73-12840

6B. Evaluation Process

SYSTEMS APPROACH TO METROPOLITAN AND REGIONAL AREA WATER AND SEWER PLANNING,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 06A.
W73-12351

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.

J. K. Garner, and C. S. Shih.
Available from the National Technical Information Service as PB-221 182, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 49, June 1973, 152 p, 41 fig, 12 tab, 135 ref. OWRR A-017-TEX (2). 14-31-0001-3844.

Descriptors: *Water resources development, *Planning, Reliability, *Texas, Cities, *Water quality control, Regional analysis.
Identifiers: San Antonio (Tex), San Antonio River Basin (Tex), Cibolo Creek (Tex), Balcones Escarpment (Tex), Edwards Plateau (Tex), Sensitivity.

The region incompassed by the San Antonio River Basin is described. Included is a brief summary of the regional economy, demography, and geographical characteristics. Additionally, quantitative information including the inventory and planning control for both surface and groundwater resource management of the San Antonio area is presented. Emphasis has been placed upon the identification of the probabilistic nature of regional water quality management. The methods and techniques developed for handling massive data and the reliability analysis for regional water quality control are also presented. (Runkles-Texas)
W73-12354

AN EVALUATION OF BALTIMORE HARBOR LAND USE POTENTIALS,
Regional Planning Council, Baltimore, Md.
M. L. Collin.
Available from the National Technical Information Service as BTL-RPC-BHLNVR-2-73. Prepared for Maryland Environmental Service, February 1973. 239 p, 34 fig, 8 tab, 4 append, 110 ref.

Descriptors: *Harbors, *Land use, Water quality, Environmental effects, *Urban renewal, Navigation, Aesthetics, Social aspects, Recreation, *Maryland, City planning.
Identifiers: *Baltimore Harbor, Optimal development, Compatible development, Ann Arundel County, Maryland, Baltimore City (Md), Maryland Port Authority, Charles Center - Inner Harbor Management, Army Corps of Engineers.

Baltimore Harbor has been an important commercial center for over 200 years. A concerted effort has been made by local planners, citizens, and governmental agencies to not only sustain the economic productivity of the Harbor but also to make the Harbor a more attractive and healthy setting for a wide range of activities and to help preserve various ecological processes. Land use on the shoreline of the Harbor is discussed. This includes discussions of the history of the Harbor area, existing land use patterns, effects of existing and uses on the water quality of the Harbor, and socio-economic trends in Harbor areas. Concepts of optimal harbor development and land use patterns are also discussed including suggested patterns for specific areas. Some features of optimal development include maximum public access to the water, compatible development of residential, recreational, and commercial land uses, redevelopment of deteriorating commercial and industrial areas, and a new lateral circulation pattern. (Elfers - North Carolina)
W73-12361

SURVEY OF WATER TRANSPORTATION POTENTIAL TO REDUCE CONGESTION AND POLLUTION IN WASHINGTON, D.C. AND OTHER MAJOR CITIES.
Lulejian and Associates, Inc., Falls Church, Va.
For primary bibliographic entry see Field 05G.
W73-12363

KAY COUNTY, OKLAHOMA, WATER AND SEWERAGE COMPREHENSIVE PLAN.
Evans and Nelson Engineering Co. and Associates, Ponca City, Okla.
For primary bibliographic entry see Field 05G.
W73-12364

FUNCTIONAL WATER AND SEWERAGE PLAN AND PROGRAM, PEE DEE REGION, SOUTH CAROLINA.
LBC and W Associates, Columbia, S.C.
For primary bibliographic entry see Field 05G.
W73-12365

TOWN OF CAIRO WASTE WATER REPORT.
Diachishn (A.) and Associates, New York.
For primary bibliographic entry see Field 05D.
W73-12366

REGIONAL UTILITIES STUDY: DRAINAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 04A.
W73-12368

REGIONAL UTILITIES STUDY: SEWERAGE VOLUME OF TECHNICAL APPENDIX.
Minges (James S.) and Associates, Inc., Farmington, Conn.
For primary bibliographic entry see Field 05D.
W73-12369

SIXTEENTH ANNUAL ARIZONA WATERSHED SYMPOSIUM PROCEEDINGS.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 04D.
W73-12403

THE VISUAL ASPECTS OF RESOURCE MANAGEMENT,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-12407

MEASURING PUBLIC RESPONSES TO VEGETATIVE MANAGEMENT,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-12408

HEURISTIC RANKING AND PRIORITIZING UNDER SUBJECTIVE CONDUCTIONS,
Bureau of Reclamation, Denver, Colo.
B. W. Paul.
Paper, ORSA, TIMS, AIEE Jt Natl Meet, Atlantic City, NJ, Nov 1972. 24 p.

Descriptors: *Project planning, *Decision making, *Priorities, Flood control, Economic justification, Economics, Project feasibility, Costs, Budgeting, Finance, Water quality, Recreation, Electric power production, Irrigation, Evaluation, Planning.
Identifiers: Environmental quality, Heuristic methods, Fish and wildlife, Criteria.

Annually the Bureau of Reclamation must decide which of some 150 potential planning projects should be identified for funding. A ranking or priority system is discussed by which the projects of different regions can be consistently evaluated and compared. Two side benefits are desired of the system: One is an audit trail of the decision process so that during Congressional hearings the reasons for choosing one project over another can be given; the other is a means of introducing and using new multiobjective planning (MOP) criteria. New Water Resource Council MOP standards require evaluation on a 4-account system; National Economic Development (NED), Regional Development (RD), Environmental Quality (EQ), and Quality of Life (QL). Results and analysis of system use are discussed. The system is shown to be a viable tool in analyzing projects for timely development. (USBR)
W73-12470

NEW TECHNIQUES FOR PARTICIPATIVE PLANNING IN WATER RESOURCES,
Colorado Univ., Boulder.
J. E. Flack.
Proc Int Symp Uncertainties Hydrol Water Resour Syst, Vol II, p 730-737, Univ Ariz, Tucson, Dec 1972. 11 ref.

Descriptors: *Planning, *Water resources, Economic efficiency, Public benefits, *Analytical techniques, Project planning, Economic justification, Statistical analysis, Environmental effects, *Decision making, Methodology.
Identifiers: Computer graphics, Alternatives, Public opinion, Policies, Statistical analysis.

A method is described that will permit selected participants in the decision-making process to exercise judgement, as contrasted with approval or disapproval, during the planning process. Major steps in this procedure are: (1) important attributes of technically complex issues surrounding water resources development are identified and defined in terms meaningful to laymen; (2) alternative water resource plans are evaluated; (3) through analysis of participants' evaluation judgments, alternative physical plans are developed; and (4) the final plan is recommended by a representative panel of citizens, agency officials, special-interest groups, and the engineer-planner. Analytical aids are provided to ensure that the recommendations of panel members are consistent with their best judgment as well as the judgment of the broader range of participants, and the technical and financial constraints of the system. Advantages of this process are that many interests become involved in the planning, several alternatives are developed, and decision making is structured to reduce disagreement and increase certainity of plan acceptance. (USBR)
W73-12472

MEASURING AND DEVELOPING METHODS OF ATTITUDE AND MOTIVATIONAL CHANGE IN IMPLEMENTING THE BIG BLUE RIVER BASIN WATER PLAN,
Doane Coll., Crete, Nebr.
E. J. McPartland.
Available from the National Technical Information Service as PB-222 274, $5.50 in paper copy, $1.45 in microfiche. 1973. 200 p, 54 tab, 45 ref, 7 append. OWRR-C-3160 (No 3696) (1). 14-31-0001-3696.

Descriptors: *Attitudes, *Behavior, *Motivation, Social aspects, Land management, Pollution abatement, Water quality, Recreation, Irrigation, Flood control, *Nebraska.
Identifiers: *Net attitude change, *Gross attitude change, Demographic characteristics, Survey research, Public opinion, *Big Blue River Basin water plan.

A series of public opinion surveys was used to determine what demographic factors were most related to people's attitudes toward water resources use, to discover public attitudes toward various issues concerned with water resources use, and to test and compare methods of communicating knowledge about water resources problems. The results indicated that higher incomes, more years of formal education, younger age groups, and town residence were more as-

sociated with positive attitudes toward water resources use than other variables. A close relationship to farming was less favorably associated with positive attitudes toward water resources use than any other demographic factor. Attitudes were generally positive toward proper farming methods, small watershed development, pollution abatement, and to a lesser extent for recreational development. Farmers opposed government regulation of farming practices, the construction of large flood control reservoirs in their area, and were divided over the issue of metering irrigation water. Informational sources pervaded by personal contact and inducing personal involvement were more closely associated with significant short-term attitude change than more impersonal informational sources such as newspapers.
W73-12491

A STUDY OF SELECTED ASPECTS OF RURAL WATER SYSTEM DEVELOPMENT IN MISSISSIPPI,
Mississippi State Univ., State College. Social Science Research Center.
P. J. Ross, R. N. Friery, and J. H. Peterson, Jr.
Available from the National Technical Information Service as PB-222 275, $3.50 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute Report, 1973. 53 p, 7 fig, 20 tab, 13 ref, 3 append. OWRR A-068-MISS (1).

Descriptors: Social aspects, *Rural sociology, Water supply, *Mississippi, Water resources development, *Rural areas, *Community development, Social change, *Regional analysis, *Regional development.

The major aims were to study patterns of the development of rural water systems in Mississippi and to examine major variables associated with patterns of rural water system development. Major findings included: (1) wide range of differences between water systems in terms of size, expansion, and racial composition of associated members, (2) distinct patterns of rural water systems development in the state following regional lines, and (3) slight to moderate associations between socioeconomic and demographic variables and rural water system development, though the differences in rural water systems development were not consistently or substantially explained by socioeconomic and demographic variables indicating that rural water system development is dependent on the interaction of many types of variables. (See also W73-12493)
W73-12492

ECONOMIC AND RELATED IMPACTS OF RURAL WATER SYSTEMS IN MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
B. M. Landry, C. P. Cartee, and D. C. Williams, Jr.
Available from the National Technical Information Service as PB-222 276, $3.50 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Report July 1973. 67p, 1 fig, 8 tab, 12 ref, 5 append. OWRR-A-060-MISS (1).

Descriptors: Water supply, *Rural areas, *Economic impact, *Mississippi, Social aspects, Water resources development, *Community development, *Rural sociology, *Social change, *Regional analysis.

Construction and operation of rural community water systems in Mississippi have resulted in economic and related impacts. This study identified the impacted variables and quantified and qualified them as possible. Variables isolated for study included direct expenditures for construction and on-going expenditures related to operations and maintenance, land values, new housing construction, and commercial and industrial activity. Other variables studied included the change in the number of households lacking a water supply, system effects on households who could not afford individual wells, changes in the use of water-using household appliances, household improvements, and changes in water use per connection. In addition to the economic impact of the direct and on-going expenditures for the systems, each of the above variables was found to be impacted to varying degrees by the presence of the water system in the community. These are quantified and qualified based on a statewide survey of all systems. (See also W73-12492)
W73-12493

THE EFFECT OF PRICE AND OTHER SELECTED VARIABLES ON WATER CONSUMPTION,
Mississippi Univ., University. Bureau of Business and Economic Research.
K. W. Hollman, and W. J. Primeaux, Jr.
Available from the National Technical Information Service as PB-222 264, $3.00 in paper copy, $1.45 in microfiche. Mississippi Water Resources Research Institute, Mississippi State, Report, July 1973. 23 p, 5 tab, 4 ref. OWRR-A-064-MISS (1).

Descriptors: *Pricing, *Water utilization, Economics, Water conservation, *Water allocation (Policy), *Mississippi, Optimum development plans, *Regression analysis, Water demand, *Community development.

The objective was to isolate the impact of selected variables on water consumption. It is important to identify the determinants of water consumption so that vital managerial decisions can be facilitated. Given the variables which affect water utilization, public officials can manipulate prices and policies to help conserve water and to allocate water supplies in the optimum manner. Data from 14 cities in north Mississippi were used in the analysis. A multiple regression model was used to determine the specific impact of the variables. The principal conclusion of the analysis was that consumers are relatively unresponsive to price differences within the price ranges displayed in the study. These results indicate that price can be used effectively as a revenue raising device but is probably ineffective as a rationing device within the current range of prices. The number of residents per household was the primary determinant of water consumption levels per household. Other factors also had a small but significant explanatory effect. In general, the results reveal that communities able to forecast correctly their future population growth will be in an advantageous position with respect to future demands on their water systems.
W73-12495

STREAM QUALITY PRESERVATION THROUGH PLANNED URBAN DEVELOPMENT,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 05G.
W73-12518

PROBLEMS OF ENVIRONMENTAL ECONOMICS.

Organization for Economic Co-operation and Development seminar June-August 1971, Paris, France, 1972. 278 p. 20 fig, 17 tab, 9 ref. Price $5.50.

Descriptors: *Environment, *Pollution abatement, *Economic efficiency, *Economics, Analytical techniques, Cost-benefit analysis, Input-output analysis, Econometrics, Cost allocation, Foreign trade, Indicators, Decision making.
Identifiers: *Environmental pollution, Policies.

This volume consists of papers written for the seminar on environmental economics organized by the 'Central Analysis and Economic Evaluation Unit' of the Organization for Economic Co-operation and Development. Three selected subjects were discussed: (1) problems and instruments of environmental cost allocation; (2) methods of analysis and environmental indicators; and (3) international problems. Introductory papers investigated possible conflict between economic growth and environmental protection. The subject of allocation of environmental costs was treated in discussions of the economic efficiency of alternative environmental policies as based upon a study of the economic principles for internalizing external economics. Determination of environmental indicators was the area of principal interest in the discussion of methods of analysis. Two lines of approach studies were the approach by sectors, including benefit-cost analysis, and the integrated approach by input-output analysis, materials balance and econometric models. International problems studied were connected with the impact of environmental policy on international trade and 'trans-frontier pollution.' (See also W73-12676 and W73-12686) (Weaver-Wisconsin)
W73-12675

ENVIRONMENTAL POLICY ISSUES: REAL AND FICTITIOUS,
University Coll. London (England). Dept of Political Economy.
W. Beckerman.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 19-38. 2 fig.

Descriptors: *Welfare (Economics), *Environment, *Gross National product, *Pollution abatement, Quality control, Values, Costs, Optimization, Economics, Economic efficiency, Decision making.
Identifiers: *Environmental pollution, Economic growth, Policies, Value judgements, Economic conflicts, Pollution control.

The main economic aspects of environmental policy are surveyed in order to differentiate those which are particularly important in formulating practical policies concerning the environment as well as those relevant to the work of an international economic organization. Two general economic aspects of environmental policy are discussed: (1) the relationship of economic growth or development and the quality of the environment, and (2) the optimum composition of national output taking into account the effects of different components of output on the environment. A conflict does not automatically arise between economic growth and environmental protection; in fact, economic growth with due regard for the environment could enable new technologies to be developed which might contribute to growth. More research should be done on social indicators and in defining the economic magnitudes indicative of welfare. To facilitate decision-making, studies should be made at the macro-economic level to analyze such problems as possible clashes between environmental goals and various national economic goals. The general need for further research into the choice of instruments for pursuing optimum environmental policies is discussed. (See also W73-12675) (Weaver-Wisconsin)
W73-12676

ANTI-POLLUTION POLICY AND COST ALLOCATION: THE ISSUES IN PRACTICE,
Padua Univ. (Italy).
G. Muraro.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 41-57. 1 fig, 9 ref.

Descriptors: *Economic efficiency, *Pollution abatement, *Cost allocation, Compensation, Pollution taxes (Charges), Economic feasibility, Control, Unit costs, Costs, Air pollution, Water pollution, Sewage, Methodology.

Identifiers: *Pollution control, *Policies, Externalities, Pareto optimality, Charges, Italy, Indirect control.

Most of the economic literature concerned with pollution advocates taxation of the polluter as a means for establishing Pareto optimality. A general discussion is presented which is intended to provoke further consideration of the practical features of various pollution abatement problems and to analyze how they hamper the optimal solution. Representative cases illustrate these problems as found in situations of consumer-to-consumer and industry-to-consumer externalities. The question of interim policy, presently under study in Italy, is reviewed. The Italian program accepts the principle of government support for polluters as an interim policy. Although polluters will eventually be expected to meet standards or pay an optimal pollution tax, interim policy would provide incentives for the adoption of pollution control measures. (See also W73-12675) (Weaver-Wisconsin)
W73-12677

NOTES ON INFORMATION AND ADMINISTRATIVE COSTS IN THE THEORY OF EXTERNALITIES,
Queen Mary Coll., London (England). Dept. of Economics.
A. Coddington.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 59-65. 5 fig.

Descriptors: *Pollution abatement, *Administrative costs, Cost allocation, Cost-benefit theory, Standards, Economic feasibility.
Identifiers: *Externalities, Cost internalization, Allocative efficiency, Information costs, Pollution control.

Although the simple theory of externalities suggests that misallocation of resources due to divergent marginal private and social costs may be corrected to some degree by internalizing this difference, this theory fails to consider the social costs associated with internalization. Two categories of such costs are presented: the costs of acquiring the information necessary to determine the allocative optimum, and the costs of administering the system of cost allocation. Only when these costs are considered can one deal with the questions of whether allocative correction is economically feasible or whether the simple theory leads to an optimal correction allocation for which the marginal costs need to be considered. Instruments for cost internalization include (1) charges, seen either as a unit tax on externality or as administered pricing of environmental inputs, (2) compensation, and (3) direct controls. (See also W73-12675) (Weaver-Wisconsin)
W73-12678

ENVIRONMENTAL QUALITY INDICATORS AND SOCIAL INDICATORS,
Commissariat General au Plan, Paris (France).
B. Cazes.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 77-82. 2 tab.

Descriptors: *Pollution abatement, *Indicators, *Cost-benefit analysis, Social values, Decision making, Benefits.
Identifiers: *Pollution control, *Environmental quality indicators, *Social indicators.

General expectations of social indicators are interpreted as including expression of results rather than costs and of more definitive results than economic concepts such as the GNP. A general discussion of ideal social indicators is presented and a system in which a social indicator should be viewed is suggested. This system includes four elements: (1) indication of continuous change with respect to the initial situation, (2) measurement of values attributed to benefits arising from each situation, (3) indication of cost involved in bringing about alternative situations envisaged, and (4) measurement of the net benefit for each alternative situation considered. The advantages of the type of social indicator suggested are discussed. Environmental quality indicators fit into the analytical scheme given for social indicators, which means that in addition to collecting physical indicators, the profits and costs of alternative policies which would change the situation indicators to a greater or lesser extent must also be considered. (See also W73-12675) (Weaver-Wisconsin)
W73-12679

PETER BOHM.
Handelshogskolan i Stockholm (Sweden).

In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 83-91.

Descriptors: *Pollution abatement, *Estimating, *Measurement, Indicators, Cost-benefit analysis, Pricing, Decision making, Benefits, Welfare (Economics), Jurisdiction.
Identifiers: *Pollution control, Social indicators, 'Willingness-to-pay'.

Environmental deterioration has been overlooked in the past because the value of such deterioration is difficult to determine. Many alternative measures of these environmental effects might be constructed; however, it is argued that such indicators are not a prerequisite for meaningful environmental policy and that they may, in fact, be misleading for policy decisions. Instead, it is suggested that what is needed is (1) a large set of physical (non-aggregated) indicators keeping track of crucial parts of the environment and (2) a code to translate changes in such data into comprehensible consequences for human life and well-being. In addition, there must be a process by which the benefits of pollution control can be compared with the costs. It is suggested that an approach to estimating the 'willingness-to-pay' of those who would benefit from a positive change in environmental quality is theoretically less objectionable and potentially practicable than alternative approaches such as opinion polls. The experimental use of the 'willingness-to-pay' approach is advocated both at the local level and as a possible solution for some multi-jurisdictional pollution cases. (See also W73-12675) (Weaver-Wisconsin)
W73-12680

THE SET UP OF THE STATISTICAL SYSTEM WITHIN WHICH THE DETERIORATION OF THE HUMAN ENVIRONMENT WILL BE ESTIMATED,
Centraal Bureau voor de Statistiek, The Hague (Netherlands).
R. Hueting.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 93-101.

Descriptors: *Statistical methods, *Pollution abatement, *Market value, *Welfare (Economics), Measurement, Indicators, Cost analysis, Estimated costs, Estimated benefits.
Identifiers: *Pollution control, Collective goods, Netherlands.

The utility attributed to an 'environmental good' to be recovered through environmental pollution control and the cost of its achievement are found to be the prerequisite for striking a balance between the increasing consumption of industrial goods and the resultant diminishing supply of collective environmental goods, such as clean water, air, and space. The attempt of the Netherlands Central Bureau of Statistics to estimate this information is reviewed under three general headings: (1) goals of the investigation of the deterioration of the environment, (2) starting points of the investigation, and (3) methods of estimation. Under the first heading it was found that costs environmental control and change in the state and trend of the environment should be estimated. With these results economic growth of the past should be recalculated, and a well-rounded picture should be presented to policy makers. The investigation should begin first with an estimation of costs and second with an appraisal of the urgency of preferences for environmental control. Different methods of estimation are recommended for each environmental component (air, water, and soil) depending on techniques of environmental control employed in each case. (See also W73-12675) (Weaver-Wisconsin)
W73-12681

SOME LIMITATIONS OF BENEFIT-COST ANALYSIS IN RESPECT OF PROGRAMMES WITH ENVIRONMENTAL CONSEQUENCES,
London Univ., (England). Dept. of Economics.
A. Coddington, H. Opschoor, and D. Pearce.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 119-123. 1 fig.

Descriptors: *Pollution abatement, *Cost-benefit analysis, Decision making, Welfare (Economics), Input-output analysis.
Identifiers: *Pollution control, Revealed preferences, Externalities.

Benefit-cost analysis is an application of neo-classical welfare economics which allows social evaluations which are sensitive to individual preferences. However, the distinction between the welfare of and the preferences of an individual is introduced. This distinction must be noticed when revealed preferences are not based on an awareness of the results of choices and on the ability to link these states causally with consumption behavior or externalities which produce them. Although benefit-cost analysis should have a role in the formulation of environmental policy (1) the limited significance of the information it provides should be fully realized, and (2) it should be secondary to substantive investigation of environmental-economic interactions in physical terms. (See also W73-12675) (Weaver-Wisconsin)
W73-12682

OUTLINE OF A MACRO-ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION: A MULTI-SECTORAL APPROACH,
Oslo Univ. (Norway). Inst. of Economics.
Steinar O. Strom.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 125-141. 2 tab, 1 ppend.

Descriptors: *Input-output analysis, *Mathematical models, Pollution abatement, Pollution taxes (Charges), Projections, Long-term planning, Decision making.
Identifiers: Residuals, Macro-economic analysis, Norway, Materials balance.

A study carried out in cooperation with the Planning Division of the Norwegian Department of Finance is briefly described. The goal was an empirical analysis of environmental spillovers from economic activities found through long-run projection analyses based upon a macro-economic framework. The conceptual framework of the study views economis activities as affecting the natural environment through (1) occupation of space (2) extraction of raw materials, and (3) return of residuals. Residuals are not identical to pollutants because the natural environment is considered to have an assimilative capacity for residuals. The macro-economic empirical study follows from a dynamic, input-output model which

includes the generation of residuals. Data employed by the model were gathered using an extended rational accounting scheme, which is described. Generation of residuals is included in the model by giving goods and services positive values, and primary and secondary wastes negative values. The behavior of the model is studies as a function of the levels of charges levied on wastes. (See also W73-12675) (Weaver-Wisconsin)
W73-12683

EVALUATION OF THE ECONOMIC EFFECTS OF ANTI-POLLUTION PUBLIC POLICY,
M. Lo Cascio.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 143-179. 3 fig, 1 tab.

Descriptors: *Pollution abatement, *Mathematical models, *Economic impact, *Econometrics, Economic prediction, Institutional constraints, Evaluation, Legislation, Welfare (Economics), Resource allocation, Costs, Prices, Productivity.
Identifiers: *Pollution control, Italy, Macro-economic analysis.

A methodology is discussed for analysing the effect on the economic system of direct State-intervention to control the main forms of pollution. The methodology presented is aimed at an economic analysis which might provide a specific solution to the problem of compatiability between one or more explicit objects of the function of social welfare (for example, balanced distribution of incomes) and the implicit objective of its function (for instance, a certain philosophy on development). In order to accomplish this an econometric model is presented which provides a basis for studying the sequence of effects induced by anti-pollution measures. These include: (1) the direct effects on costs and prices, (2) the effects on the demand for equipment, and (3) the effects on the structure of final demand, on wages and on output levels. A solution is achieved through simultaneously assessing the direct and indirect effects of pollution on costs and prices in 54 economic sectors over the time period up to 1975. (See also W73-12675) (Weaver-Wisconsin)
W73-12684

ECONOMIC EFFECTS OF TECHNOLOGY CHANGES IN RELATION TO THE ENVIRONMENT,
Bari Univ. (Italy). Instituto di Merceologia.
G. Nebbia.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 181-197. 3 tab.

Descriptors: *Input-output analysis, *Pollution abatement, Economics, Welfare (Economics), Technology, Pollutants, Waste assimilative capacity, Wastes.
Identifiers: Residuals, Italy, Technological change, Macro-economic analysis.

One of the objectives of the environmental activity of the Organizations for Economic Co-operation and Development, is to analyze and evaluate the economic effects of environmental problems consisered as an integrated system related to economic and social development. Before such an approach can be made, biological and ecological statistics must be gathered; these should include quantities of resources entering into the production and consumption processes as well as the volume, chemical composition, and destination of related wastes. The specific nature and characteristics of these data are discussed. Given these statistics it is recommended that analysis form only a part of broader research directed towards the investigation of how technological change may optimize the production of commodities at a greater level of social and environmental welfare. Work being done towards this purpose at Bari University, Italy, is describes as the construction of circuits which trace the input and output flows of resources as well as the types of wastes associated with each output and the distribution of each of those wastes in the environment. (See also W73-12675) (Weaver-Wisconsin)
W73-12685

THE ROLE OF UNIFORM STANDARDS IN INTERNATIONAL ENVIRONMENTAL MANAGEMENT.
Maryland Univ., College Park. Coll. of Business and Public Administration.
J. H. Cumberland.
In: Problems of Environmental Economics, Organization for Economic Co-operation and Development, Paris, 1972, p 239-253. 4 fig.

Descriptors: *Cost allocation, *Standards, *Pollution abatement, Management, Wastes, Pollutants, Industrial production, Welfare (Economics).
Identifiers: *International uniform standards, *Pollution control, Externalities, Pareto optimality.

The question of whether it is desirable to introduce a system of uniform international environmental standards is analyzed in the context of the differences in socio-economic structures, competitive strength, and natural resources between countries. It is argued that trade problems and purely economic criteria should not be allowed to obscure the need for compulsory standards when human health is threatened. Uniform standards are indispensable for ensuring biological safety and maintaining the quality of common property resources such as seas, lakes, rivers, and air. However, differences between countries are shown to make uniform standards ineffective with respect to cost allocation problems. Alternative economic measures, such as effluent charges and subsidies, would be superior to uniform product standards imposed upon heterogeneous economics. (See also W73-12675) (Weaver-Wisconsin)
W73-12686

EVALUATION OF ENVIRONMENTAL INTANGIBLES,
Department of Indian Affairs and Northern Development, Ottawa (Ontario). National and Historic Parks Branch.
N. H. Coober, and A. K. Biswas.
Genera Press, Bronxville, New York, 1973. 77 p. 14 fig, 320 ref.

Descriptors: *Intangible benefits, *Cost-benefit analysis, *Recreation, *Analytical techniques, Measurement, Aesthetics, Mathematical studies, Values, Evaluation.

Financial justification of environmental programs is vital to their implementation by either the private or public sectors. Such justification requires measuring intangible benefits and costs associated with various programs. Those techniques of measurement accepted in the past or currently proposed in the literature are synthesized, organized, and criticized. The report has three sections: (1) a historical and economic background of evaluation techniques and their relevance to benefit cost analysis, (2) a classification and discussion of techniques for economic evaluation of environmental intangibles and (3) a classification and critical review of non-monetary evaluation and comparison techniques. Two areas of methodology, each with opposing goals, may be distinguished. One seeks absolute values for intangibles; the other, relative values. Most authors reviewed agree on the need for a uniform approach allowing wider comparative evaluations. It is generally agreed that with minor modifications, methods suggested by Clawson (1959) are most expedient. The problem of inaccuracies in value estimates is thoroughly reviewed. (Weaver-Wisconsin)
W73-12688

PERUVIAN FISHERIES: CONSERVATION AND DEVELOPMENT.
California State Univ., Fresno.
B. B. Smetherman, and R. M. Smetherman.
Economic Development and Cultural Change, Vol 21, No 2, p 338-351, 1973. 2 tab, 46 ref.

Descriptors: *Conservation, *Commercial fishing, *Economic impact, Export, Economic efficiency. Marketing, Fish harvest, International waters, Regulation.
Identifiers: *Economic development, *Peru, *Fish meal, Anchovies, Development linkages, Nationalization, Guano.

Accelerated development of Peru's fishing industry has resulted from the growth in the production of fish meal from anchovies. The effects of this development on Peruvian politics and economics is reviewed. The economic history of Peru indicates its successive failures to channel primary resource booms into sustained economic growth. However, regulation of the anchovy resource has been attempted, and is becoming more effective. Regulation schemes have included encouragement of industrial self-restraint, imposition of closed seasons, and regulation of technology to control catch. In addition, Peru joined with other countries to organize and control the industry, and eventually nationalize fish meal marketing. The fishing industry's role in economic development is small as shown by the limited number of forward linkages that have accrued. However, the industry is very important for generating export income, and stimulating backward linkages and the consequential employment. The present government intends to expand the industry and use it as a base for sustained economic development. (Weaver-Wisconsin)
W73-12689

ECONOMICS IN SOIL AND WATER CONSERVATION,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 03F.
W73-12691

EXTINCTION OF A FISHERY BY COMMERCIAL EXPLOITATION: A NOTE,
London School of Economics and Political Science (England).
J. R. Gould.
Journal of Political Economy, Vol 80, No 5, p 1031-1038, 1972. 4 fig., 7 ref.

Descriptors: *Commercial fishing, *Economics, *Exploitation, Fish populations, Sustained yield, Yield equations, Mathematical models.
Identifiers: Extinction, Catch locus.

Inferences concerning the inability of the economic theory of commercial fishing to incorporate possible extinction of a fishery as drawn by Vernon Smith (1969) are reexamined. Traditional theory, as illustrated by analysis of the sustainable yield function of fishing effort, is shown to provide the basis for Smith's inference. A reformulation of this model provides a stronger analytical tool for the discussion of extinction. This reformulation introduces economic considerations via a catch locus and biological factors via a natural population increase curve. It is shown that commercial extinction of a fish population is conceivable despite the fact that fishing would become unprofitable long before the population of a given species was wiped out. This follows from the notion of minimum biologically viable population. (Weaver-Wisconsin)
W73-12692

WATER RESOURCE DECISON MAKING--HOW EFFECTIVE IS THE PUBLIC INPUT,
Oregon State Univ., Corvallis.

J. G. Monks.
In: 1973 Proceedings of the 19th Annual Meeting, 'Realism in Environmental Testing and Control,' April 2-5, 1973, Anaheim, California, p 345-350. 2 fig, 4 ref.

Descriptors: *Water resources development, *Decision making, *Social values, *Water Allocation (Policy), Social impact, Social aspects, Administration, Optimum development plans, Political aspects, Project planning, Benefits, Project post-evaluation, Standards, Social participation, *Oregon.
Identifiers: Case study, *Junction City (Ore.), Public preferences.

Natural resource management often necessitates that society collectively undertake development and control activities. However, in order that the governing system serve to achieve allocative efficiency as well as the results the public wants, resource management objectives must be clearly delineated, and progress monitored and carefully directed to insure that activities are carried out according to plan. The Junction City (Oregon) Water Control District was used as a case study of the current structure of water management to determine whether it satisfied these requirements. Beginning with its historical background, the effectiveness of the allocation process is questioned as to whether the objectives were defined in the terms of public interest and its developmental and control capabilities. It is concluded that standards for social or ecological outcomes were not precisely defined nor were outcomes a democratic representation of the project area population's preference. Legislation was used to benefit a few citizens at the expense of the many. In addition, the allocation structure did not effectively control adverse environmental effects which are of concern to the public. (Weaver-Wisconsin)
W73-12693

EXTERNALITIES, WELFARE, AND THE FEASIBILITY OF CORRECTIVE TAXES,
State Univ. of New York, Stony Brook.
R. Dusansky, and P. J. Kalman.
Journal of Political Economy, Vol 80, No 5, p 1045-1051, September/October 1972. 1 ref.

Descriptors: *Welfare (Economics), *Economic efficiency, *Mathematical models, *Optimization, Taxes.
Identifiers: *Corrective taxes, *Pigouvian tax policy, Profit maximization, Separable cost functions, Subsidies, Technological externalities, Cost functions.

Implementation of the Pigouvian tax policy for correcting technological externalities is dependent on the nature of cost functions faced by the relevant firms. The Pigouvian approach assumes separable cost functions where the marginal costs of the firm are dependent only on its own output. Given such cost functions the policy maker may impose corrective unit taxes (or subsidies) such that the actual outputs arrived at by individual profit maximization equal those deemed optimal as a result of social welfare maximization. In the case of non-separable cost functions, the marginal cost functions of the firms involved are interdependent. Because profit maximization decisions of individual firms are not independent of the output of other firms, selection of corrective taxes is severely complicated, if not made impossible. Given a partition of the assumed n-firm economy, the necessary and sufficient conditions for separability are solved for the class of cost functions consistent with feasible implementation of Pigouvian tax policy. Similarly, the feasible set of cost functions is derived given the assumption of multiproduct firms. Finally, these sets of feasible cost functions are shown to include a wider range than indicated by the Davis and Whinston results. (Weaver-Wisconsin)
W73-12694

ANTIPOLLUTION POLICIES, THEIR NATURE AND THEIR IMPACT ON CORPORATE PROFITS,
For primary bibliographic entry see Field 05G.
W73-12695

IDENTIFICATION AND ACHIEVEMENT OF ENVIRONMENTAL QUALITY LEVELS IN MANAGING THE USE OF NATURAL RESOURCES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-12696

PUBLIC LAND USE POLICY: NEEDS, OBJECTIVES, AND GUIDELINES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 04A.
W73-12697

COSTS AND PROFITABILITY IN THE COMMERCIAL FISHING INDUSTRY: THE INSURANCE DILEMMA,
Washington Univ., Seattle. Div. of Marine Resources.
M. L. Redfield.
Washington Sea Grant Publication WSG-MP 71-4, November 1971. 59 p 6 fig.

Descriptors: *Commercial fishing, *Insurance, *Cost-benefit analysis, Safety, Return (Monetary), Working conditions, Obsolescence, Costs, Profits, Trade associations, Compensation, Damages, Competition.
Identifiers: Foreign competition, Local competition, Policy formulation.

Insurance coverage constitutes a disproportionate share of the sharply increasing costs of operating a fishing vessel; this threatens the viability of the United States' fishing industry in the face of foreign competition. The current study found that high insurance costs reflected high vessel casuality rates caused by extreme competitive pressures and low profits. This condition follows from high labor costs, high costs of boats and equipment, which are required by law to be of United States manufacture (and consequently are more costly), the influence of price competition with imports and the system of free entry which reduces the catch of each participant. These high costs, combined with low profitability, result in deteriorating equipment and working conditions (smaller crews, longer hours, more intensive effort), an older labor force, and thus increased accidents. Alternatives for maximum reduction of insurance expenses include (1) schemes for continuing private insurance, (2) eliminating barriers against purchase and use of foreign equipment, (3) instituting limited entry to the industry, and (4) laissez-faire. Choice among alternatives must be based upon cost-benefit analysis. Limited comparison indicated that an optimal program will consist of safety regulation combined with alternatives (1) or (2). (Weaver-Wisconsin)
W73-12699

VALUATION OF TIMBER, FORAGE AND WATER FROM NATIONAL FOREST LANDS,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. F. O'Connell.
The Annals of Regional Science, Vol 6, No 2, p 1-14, 1972. 3 fig, 18 ref.

Descriptors: *National forests, *Lumbering, *Forage, *Value, Linear programming, Land management, Economic efficiency, Public lands, Recreation demand, Water demand, Profit, Market value, *Arizona.
Identifiers: *Salt-Verde Basin (Ariz.), Resource valuation, Multiple-use linear programming, Relative price trends.

A procedure for determining relative trade-off values for timber, forage and water resources is presented. Such a procedure is essential for resource management decisions concerning changes in water yields within a watershed. Data used are specific to the Salt-Verde Basin in central Arizona, but the methodology is applicable to any National Forest lands. Prices in the primary resource markets fail to reflect the full value of those resources to society because of market imperfections, administrative procedures, and various institutionalized constraints. Since each of the resources is an input for a product sold in markets characterized by competitive conditions, a range of resource values was derived from a simple valuation model based upon the price of secondary products such as lumber, livestock, and feed grains. Resource value was assumed to be within limits set by market prices paid and maximum prices manufacturers could pay. A multiple-use linear programming model is suggested to determine optimal land management programs given the needs of the public as projected from relative price trends of the secondary products studied. Future demand-supply conditions are expected to increase the value of timber output relative to the value of water and forage output. (Weaver-Wisconsin)
W73-12701

DETERMINATION OF PUBLIC ENVIRONMENTAL PREFERENCES IN WATER RESOURCES PLANNING AND DEVELOPMENT,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering; and Clemson Univ., S.C. Dept of Economics.
Benjamin C. Dysart, III, and Andy H. Barnett.
In: American Society of Civil Engineers Annual and National Environmental Engineering meeting, October 18-22, 1971, St. Louis, Missouri. 28 p. 2 fig., 7 tab. OWRR B-017-SC (6).

Descriptors: *Surveys, *Social values, *Planning, *Water quality, Social participation, Water pollution control, Industrial wastes, Correlation analysis, Water resources development, Decision making, *South Carolina.
Identifiers: *Public preferences, *Greenville County (S.C.), Reedy River (S.C), Willingness-to-pay, Mail questionnaire.

A crucial element of the water resources planning process is the evaluation of public environmental preferences early in the plan's formulation. The mail questionnaire technique was employed to provide reliable information and minimize the time, difficulty and expense. Although public referenda authorize specific development plans, the reported technique approximates acceptable expenditure levels and indicates which sectors of the populace might respond to additional educational efforts concerning the desirability of the project. The feasibility of implementation of water quality improvement plans for Greenville County, South Carolina, was used as a case for study. Response to the mail questionnaire established an ordinal preference ranking of potential uses of the Reedy River with scenic appeal ranking first. Correlation analysis of public ranking of critical problems indicated that water pollution was third to crime and education. Preference analysis indicated that the public supported increased expenditure for water pollution control and that residents were willing to bear what they considered to be a reesonable cost of a significant level of improvement in environmental quality. (Weaver-Wisconsin)
W73-12706

ELEMENTS OF THE WATER RESOURCES SITUATION IN ALABAMA,
Geological Survey, University, Ala.
D. B. Knowles, and H. C. Barksdale.
Available from NTIS, Springfield, Va 22151 as PB-214 181. Price $3.75 printed copy; $1.45 cents

microfiche. December 1969 (revised August 1970). 28 p.

Descriptors: *Water resources development, *Administration, *Alabama, Project planning, Water utilization, Hydrology, Flood plains, Streamflow, Low flow, Waste disposal, Water pollution control, Gaging stations, Observation wells, Water quality, Estuaries, Reviews.

The water-resources situation in Alabama has many facets ranging from water supply to waste disposal, from floods to droughts, and from navigation to recreation. Within this wide range of topics two common elements have been selected for consideration-- factors intimately related to the hydrologic cycle, and significant areas wherein the knowledge and data are inadequate. A discussion of the hydrologic cycle provides a background of understanding. This is followed by a discussion of the types of data and studies that are required for a better understanding of water related problems with recommendations for needed supplemental or additional studies. Most water-resources problems relate in one way or another to the availability of water. Problems of water supply cover much of the water-resources field and are not restricted to the availability of water for domestic, industrial, or agricultural purposes. Under this concept, water for operation of navigational locks, dilution of wastes, launching of a boat or for support of fisheries all become water-supply problems. It is in this broader sense that water-supply problems and the knowledge and data needed for their solution are discussed. (See also W73-12315) (Woodard-USGS)
W73-12749

MULTIPLE-USE PROBLEMS IN THE GREAT LAKES.
Available from NTIS, Springfield, Va. 22151 as COM-73-10249 - Price $3.00 printed copy; $1.45 microfiche. Wisconsin University Sea Grant Program Report, Wis-SG-72-107 (Public Information Report No 7) 1972. 50 p.

Descriptors: *Regional development, *Great Lakes, *Water resources development, *Water policy, *Environmental control, Water pollution control, International waters, Economic aspects, Social aspects, Legal aspects, Water demand, Water supply, Water quality, Ecology, Water utilization, Multiple-purpose projects, Management, Conferences, Reviews, Evaluation.
Identifiers: Symposium.

This is the last in a three-part series of public information reports based on an October 1970 University of Wisconsin Sea Grant Conference, 'The Great Lakes-Sink or Swim.' One of the issues that frequently is identified in Great Lakes research is the problem of multiple use and the attendant conflicts that the users may face. In the past these conflicts seemed inevitable but not catastrophic. Population and use rate, however, is increasing, and the interference from one user to the next is demanding more attention to resource management practices. The University of Wisconsin Sea Grant program has attempted to look at the use pattern as a starting point for problem identification. This part contains the following papers: Our Environmental Equilibrium in Nature, by D. V. Anderson; A Symposium on the Preservation and Multiple-Use Problems in the Great Lakes, by P. M. Higgins; Toward a Regional Policy for the Great Lakes, by J. L. Hazard; the Planning Viewpoint, by D. C. N. Robb; and An Industrial Point of View 1970, by S. Burnstein. (See W73-12961 thru W73-12965) (Woodard-USGS)
W73-12960

OUR ENVIRONMENTAL EQUILIBRIUM IN NATURE,
Toronto Univ. (Ontario).
D. V. Anderson.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 7-13, 1972.

Descriptors: *Regional development, *Great Lakes, *Water resources development, *Water policy, Environmental effects, Environmental control, Water pollution control, International waters, Economic aspects, Social aspects, Legal aspects, Water demand, Water supply, Water quality, Ecology, Water utilization, Management, Multiple-purpose projects, Reviews.
Identifiers: Symposium.

The public must decide how active the control of the development of the shores of the Great Lakes should be before the water managers can begin to act. Several areas of decision are: whether the cities should be allowed to make use of lake bottoms for extending valuable lakeside real estate; whether to protect the north shore of Lake Erie from erosion, the major source of pollution in the lake, by constructing polders; whether to place the dykes a mile offshore to claim 100 sq mi land, rather than to maintain the status quo; whether to attempt to sustain aquatic life; whether to site powerplants for warming harbor waters and canals, or for power needs only; and finally, whether to stop discharging sewage into the lakes and what treatment to use. (See also W73-12960) (Woodard-USGS)
W73-12961

A SYMPOSIUM ON THE PRESERVATION AND MULTIPLE-USE PROBLEMS IN THE GREAT LAKES,
Department of Fisheries and Forestry, Ottawa (Ontario).
For primary bibliographic entry see Field 05C.
W73-12962

TOWARD A REGIONAL POLICY FOR THE GREAT LAKES,
Michigan State Univ., East Lansing.
J. L. Hazard.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 23-34, 1972. 15 ref.

Descriptors: *Regional development, *Great Lakes, *St. Lawrence Seaway, *Water policy, *Environmental control, Planning, Water resources development, International waters, Federal Government, State governments, Economic aspects, Social aspects, Water demand, Water supply, Water utilization, Multiple-purpose projects, Management.

An overview of the Great Lakes-St. Lawrence system is presented to inform the general public as well as industrial and political decision makers. The movement toward a regional policy might take on more coherence as it matures by increasing efforts toward: achieving cohesive regional units around the lakes; identifying changing regional needs and goals; gaining a systematic knowledge of the lakes, their behavior and condition; developing programs that satisfy the needs of the present and future generations; and implementing those programs through appropriate channels--regional, federal, dominion--and now, responsive modes of organization. These steps would provide flexible policies for the lakes. And if successful in this major endeavor, it will be possible to move toward the following objectives over the long run: to preserve and improve the lakes; to expand the mid-continent economy; to enhance the region's contribution to the external world; and to harmonize working relations with the provinces and Canada. (See also W73-12960) (Woodard-USGS)
W73-12963

THE PLANNING VIEWPOINT,
Great Lakes Basin Commission, Ann Arbor, Mich.
D. C. N. Robb.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 35-45, 1972.

Descriptors: *Regional development, *Great Lakes, *Water policy, *Environmental control, Planning, Water resources development, International waters, Legal aspects, Economic aspects, Social aspects, Water demand, Water supply, Water utilization, Multiple-purpose projects, Management.

The Great Lakes are used for water supply, transportation, recreation, power, fish, and as dumps for solid and liquid waste disposal. The lakes have a very large, but still limited, capacity to support any one of the above uses. In addition, as individual uses increase, they begin to conflict with each other. Transportation, with its demand for high lake levels, encourages conditions which result in shore erosion with negative effects on water supply, recreation and fish. Increasing use of the lakes for waste disposal creates problems for fish, recreation, water supply and, to a limited extent, for power. The demands on the lakes from all of the above uses are dependent to a large extent on both population and per capita demand, both of which continue to increase. Serious attention is just beginning to be paid to the possibilities of managing population and per capita demand toward partial solution of present environmental problems. Effective resource management requires: clearly defined goals and objectives; adequate data on present conditions; adequate procedures to predict consequences on the resources of alternative future actions; clear definition of responsibility and authority; and adequate funding. (See also W73-12960) (Woodard-USGS)
W73-12964

AN INDUSTRIAL POINT OF VIEW-1970,
Wisconsin Electric Power Co., Milwaukee.
S. Burnstein.
In: Multiple-Use Problems in the Great Lakes; Wisconsin University Sea Grant Report WIS-SG-72-107 (Public Information Report No 7), p 47-51, 1972.

Descriptors: *Regional development, *Great Lakes, *Water resources development, *Water policy, *Environmental control, Industry, Electric power industry, International waters, Economic aspects, Social aspects, Legal aspects, Water demand, Water supply, Water utilization, Multiple-purpose projects, Management.

The Great Lakes present a unique natural resource whose utilization has sponsored the basic activities of over 60 million people who live around its shores. Continued use of this resource is unavoidably tied to the welfare of these millions. Preservation of the quality of this resource is essential to its continued use. The multiple uses of the Great Lakes, with minor omissions, are discussed in five basic categories: drinking water and sanitation; transportation; industrial processes; food supply; and recreation. Industry is a summation of all the other uses. It is impossible for drinking water and sanitation to serve the vast population of the region without piping and power and the waterworks and the public works that industry provides. A transportation industry on the lakes, commercial fishing industries, and even a recreational industry, are all typical of those devices which in their specialized areas create or enhance the value of things. The electric power industry, which is perhaps the key to all other industrial and economic development, is the largest nonconsumptive water user on the Great Lakes. (See also W73-12960) (Woodard-USGS)
W73-12965

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

REGIONAL SEWER SYSTEM, PLANNING AND COST ESTIMATION MODEL,
Regional Planning Council, Baltimore, Md.
For primary bibliographic entry see Field 05G.
W73-12357

THE EFFECT OF PRICE AND OTHER SELECTED VARIABLES ON WATER CONSUMPTION,
Mississippi Univ., University. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 06B.
W73-12495

ENVIRONMENTAL COST OF MINING,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12687

EXTERNALITIES, WELFARE, AND THE FEASIBILITY OF CORRECTIVE TAXES,
State Univ. of New York, Stony Brook.
For primary bibliographic entry see Field 06B.
W73-12694

ANTIPOLLUTION POLICIES, THEIR NATURE AND THEIR IMPACT ON CORPORATE PROFITS,
For primary bibliographic entry see Field 05G.
W73-12695

IDENTIFICATION AND ACHIEVEMENT OF ENVIRONMENTAL QUALITY LEVELS IN MANAGING THE USE OF NATURAL RESOURCES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-12696

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
For primary bibliographic entry see Field 04B.
W73-12698

COSTS AND PROFITABILITY IN THE COMMERCIAL FISHING INDUSTRY: THE INSURANCE DILEMMA,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 06B.
W73-12699

NOTE ON CHARGES AND BRIBES IN THE LONG RUN WITHIN WATERSHEDS,
Wyoming Univ., Laramie. Coll. of Commerce and Industry.
For primary bibliographic entry see Field 05G.
W73-12702

CONSTRUCTION COSTS OF WATER SUPPLY AND SEWAGE NETWORKS IN POLAND--1961-1970,
Institute of Public Utility Services, Warsaw (Poland).
M. Gorczyca.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, p 9458-1003, 1972. 3 fig, 8 tab.

Descriptors: *Construction costs, *Water supply, *Sewage, *Cost analysis, Estimated costs, Direct costs, Unit costs, Return (Monetary).
Identifiers: *Warsaw (Poland), *Lodz (Poland), Profitability, Cost, *Poland.

The Institute of Public Utility Services at Warsaw, Poland, has studied the building costs of water supply and sewage networks in order that any cost fluctuations may be continuously supervised, compared with building estimates, and profitability assessed. The factors isolated as primary determinants of these costs included the following site features: (1) hydrogeological conditions, (2) costs of removal of previous installations, (3) technical, economic and organizational solutions used by contractors, (4) unusual construction conditions, and (5) the level of estimated prices for construction assembly work and production factors. A classification and calculation scheme is presented for the analysis of building costs. Direct costs are those associated with a specific site while general costs are site-unrelated. Unit costs of building data indicated considerable variation in costs between various pipe cross sections and materials. Analysis of these costs for the period 1961-1970 with a combined index indicated a strong price preference for asbestos-cement pipes. Despite price increases during the same period, a steady trend of profits had prevailed. (Weaver-Wisconsin)
W73-12703

COST CURVES FOR CROSS-DRAINAGE WORKS,
Government Coll. of Engineering, Aurangabad (India).
For primary bibliographic entry see Field 04A.
W73-12704

A STUDY OF THE ECONOMIC IMPACT ON THE STEEL INDUSTRY OF THE COSTS OF MEETING FEDERAL AIR AND WATER POLLUTION ABATEMENT REQUIREMENTS. PART I - EXECUTIVE SUMMARY.
For primary bibliographic entry see Field 05G.
W73-12707

IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. PART I. THE IMPACT OF ENVIRONMENTAL CONTROL COSTS.
Sobotka (Stephen) and Co., New York.
For primary bibliographic entry see Field 05G.
W73-12708

A DESCRIPTIVE ANALYSIS OF THE BAKERY PRODUCTS INDUSTRY DETAILING INDUSTRY TRENDS AND CHARACTERISTICS RELEVANT TO ECONOMIC IMPACT ANALYSIS OF ENVIRONMENTAL STANDARDS. PART II.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12709

A STUDY OF THE IMPACT OF POLLUTION STANDARDS AND CHARGES ON THE BAKERY INDUSTRY. PART III.
Ernst and Ernst, Washington D.C.
For primary bibliographic entry see Field 05G.
W73-12710

6D. Water Demand

COMPREHENSIVE PUBLIC WATER SUPPLY STUDY FOR SCHENECTADY COUNTY, NEW YORK.
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 03D.
W73-12358

OUTDOOR RECREATION IN THE BALTIMORE AREA.
Regional Planning Council, Baltimore, Md.

July 1967. 156 p, 23 fig, 21 tab, 56 ref, 1 append.

Descriptors: *Recreation, *Recreation demand, *Watersheds, Planning, Models, Projections, Standards, *Maryland, Regional analysis, Regional development.
Identifiers: Open space, Regional Planning Council, *Baltimore region, Water-based recreation.

Study focuses on specific needs and preferences of people in the five-county Baltimore region and looks at recreation and open space in terms of several types of activities. A key element in this analytical approach is the recreation trip distribution model which projects the number and location of trips for various recreation purposes. The recreation plan is based on a system of open space corridors proposed in the Council's Suggested General Development Plan and includes numerous park areas and activities to be incorporated within this framework. These activities include swimming, picnicking, fishing, bicycling, boating, camping, hiking, and driving for pleasure. Special attention is placed on use of individual watersheds in the region and the demand-supply relationships for each watershed. (Elfers - North Carolina)
W73-12360

6E. Water Law and Institutions

ANNUAL REPORT OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION, 1972.
New York State Urban Development Corp., New York.
For primary bibliographic entry see Field 03D.
W73-12356

INTERIM AREAWIDE WATER AND SEWER PLAN: BEL-O-MAR AREA.
Candeub, Fleissig and Associates, Newark, N.J.
For primary bibliographic entry see Field 05G.
W73-12362

MEASURING AND DEVELOPING METHODS OF ATTITUDE AND MOTIVATIONAL CHANGE IN IMPLEMENTING THE BIG BLUE RIVER BASIN WATER PLAN,
Doane Coll., Crete, Nebr.
For primary bibliographic entry see Field 06B.
W73-12491

EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-12510

ONTARIO UNHAPPY WITH EFFORTS OF INDUSTRY TO HALT POLLUTION,
For primary bibliographic entry see Field 05G.
W73-12538

REPORT ON ARKANSAS VALLEY CONDUIT FOR SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT, FOUR CORNERS REGIONAL COMMISSION AND U.S. BUREAU OF RECLAMATION.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W73-12577

THE ROLE OF UNIFORM STANDARDS IN INTERNATIONAL ENVIRONMENTAL MANAGEMENT.
Maryland Univ., College Park. Coll. of Business and Public Administration.
For primary bibliographic entry see Field 06B.
W73-12686

FLOOD INSURANCE FOR VIRGINIA.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W73-12690

WATER RESOURCE DECISON MAKING--HOW EFFECTIVE IS THE PUBLIC INPUT,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06B.
W73-12693

PUBLIC LAND USE POLICY: NEEDS, OBJECTIVES, AND GUIDELINES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 04A.
W73-12697

PUBLIC SUPPORT OF PRIVATE WATER RESOURCE DEVELOPMENT IN AGRICULTURE--WITH IMPLICATIONS FOR FIRM GROWTH,
Wyoming Agricultural Experiment Station, Laramie.
For primary bibliographic entry see Field 04B.
W73-12698

EFFECTS OF PESTICIDES IN WATER--A REPORT TO THE STATES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-12752

6F. Nonstructural Alternatives

NEW TECHNIQUES FOR PARTICIPATIVE PLANNING IN WATER RESOURCES,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 06B.
W73-12472

FLOOD INSURANCE FOR VIRGINIA.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.

(1972)

Descriptors: *Insurance, *Flood damage, *Flood protection, *Virginia, Land use.
Identifiers: National Insurance Program, Insurance coverage.

Basic public information is presented to Virginia residents of flood-prone communities of the danger of floods, their potential damage, or control, and opportunities for flood insurance through the National Flood Insurance Program. This low cost insurance program requires that governmental bodies of insured communities plan and adopt land-use and Land management measures that will reduce flood loss. Protection from economic loss is provided while at the same time potential losses are reduced. Coverage includes most structures and their contents up to specified limits. An Emergency Program allows for coverage during the interim period in which land use plans are being formulated and implemented. Public support is encouraged and recommendations are made for specific community actions to obtain this insurance. (Weaver-Wisconsin)
W73-12690

6G. Ecologic Impact of Water Development

CALIFORNIA POWER PLANT SITING STUDY: VOLUMES, I, II, AND III.
Holmes and Narver, Inc., Anaheim, Calif.
For primary bibliographic entry see Field 05G.
W73-12574

ENVIRONMENTAL IMPACT STUDY.
Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
For primary bibliographic entry see Field 05G.
W73-12580

MAINTENANCE OF THE HUDSON RIVER CHANNEL, NEW YORK, NAVIGATION PROJECT, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 08B.
W73-12588

MATHEMATICAL MODELS IN ECOLOGY, PROCEEDINGS OF THE 12TH SYMPOSIUM.
For primary bibliographic entry see Field 06A.
W73-12653

PROBLEMS OF ENVIRONMENTAL ECONOMICS.
For primary bibliographic entry see Field 06B.
W73-12675

ENVIRONMENTAL QUALITY INDICATORS AND SOCIAL INDICATORS,
Commissariat General au Plan, Paris (France).
For primary bibliographic entry see Field 06B.
W73-12679

THE SET UP OF THE STATISTICAL SYSTEM WITHIN WHICH THE DETERIORATION OF THE HUMAN ENVIRONMENT WILL BE ESTIMATED,
Centraal Bureau voor de Statistiek, The Hague (Netherlands).
For primary bibliographic entry see Field 06B.
W73-12681

ECONOMIC EFFECTS OF TECHNOLOGY CHANGES IN RELATION TO THE ENVIRONMENT,
Bari Univ. (Italy). Instituto di Merceologia.
For primary bibliographic entry see Field 06B.
W73-12685

EVALUATION OF ENVIRONMENTAL INTANGIBLES,
Department of Indian Affairs and Northern Development, Ottawa (Ontario). National and Historic Parks Branch.
For primary bibliographic entry see Field 06B.
W73-12688

PROPOSED OIL POLLUTION REGULATIONS, (FINAL ENVIRONMENTAL STATEMENT).
Coast Guard, Washington, D.C. Marine Environmental Protection Div.
For primary bibliographic entry see Field 05G.
W73-12955

OUR ENVIRONMENTAL EQUILIBRIUM IN NATURE,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 06B.
W73-12961

07. RESOURCES DATA

7A. Network Design

A PROPOSED STREAMFLOW DATA PROGRAM FOR CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 04A.
W73-12748

ELEMENTS OF THE WATER RESOURCES SITUATION IN ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 06B.
W73-12749

REAL-TIME INTERACTIVE INSTRUMENTATION,
Purdue Univ., Lafayette, Ind.
D. O. Jones.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich. 48106. Order No 73-6142. PhD Dissertation, 1970. 167 p.

Descriptors: *Instrumentation, *Digital computers, *Data processing, *Optimization, Automatic control, Laboratory tests, Testing procedures, Laboratory equipment.
Identifiers: *Real-time computers, *Interactive computer systems, Stationary electrode polarography, Data interpretation, On-line computers.

The critical experimental design parameters elucidated by a software-oriented study were considered and the translation to hardware-oriented instrumentation is described. The hardware device was evaluated experimentally in the laboratory and the capabilities compared to the software-generated experimentation. Results indicate the essentially identical analytical performance is achieved at greatly reduced complexity of operation and expense. In addition, the hardware-oriented instrumentation provides the capability for greater measurement rates. (Holoman-Battelle)
W73-12850

7B. Data Acquisition

OBSERVATIONS OF INTERMEDIATE AND SMALL SCALE TURBULENT WATER MOTION IN A STRATIFIED ESTUARY (PARTS I AND II),
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-12424

THE EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05A.
W73-12426

EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES,
National Environmental Satellite Service, Washington, D.C.
A. E. Strong.
Available from NTIS, Springfield, Va. 22151 as E73-10017 - Price $3.00 printed copy; $1.45 microfiche. NASA Contract Report CR-129943 (Environmental Research Technology Satellite Proposal No 106), 1973.

Descriptors: *Water pollution sources, *Lake Erie, *Lake Ontario, *Remote sensing, *Aerial photography, Thermal pollution, Sediment transport, Algae, Industrial wastes, Effluents, Path of pollutants, Satellites (Artificial), Instrumentation.
Identifiers: *ERTS.

An evaluation of ERTS projects is presented for the fourth bimonthly reporting period, October to December 1972. A NOAA Buffalo Dehavaland Aircraft was instrumented with a multispectral camera and dual-channel IR scanner for environmental studies of Lake Erie and Lake Ontario. The Buffalo aircraft flew most of the Lake Erie shoreline west of Long Point, Ontario, and Ashtabula, Ohio. ERTS-1 crossed Lake Erie while the Buffalo was imaging the Canadian shoreline. Major features observed were: thermal and sediment features off Pointe aux Pins and Pointe Pelee; a thick algal mat in the Bass Islands area several hundred feet wide and 10-15 miles long; a portion of the Cuyahoga River plume at Cleveland; powerplant effluent near Monroe, Michigan; and Detroit River and Lake St. Clair. The western side of Lake St. Clair was black. Expected accomplishments for the next reporting period are outlined. (Woodard-USGS)
W73-12429

VARIABLE SAMPLING FREQUENCY - A NEW ADAPTIVE TECHNIQUE,
A. A. Sutherland, Jr.
Control Engineering, Vol 20, No 4, p 33-35, April 1973. 3 fig, 1 ref.

Descriptors: *Sampling, *Antomatic control, Control systems, Monitoring, Algorithms.
Identifiers: *Adaptive control.

An adaptive technique has been developed for sampling for control of plant processes which vary randomly with time. A simple digital algorithm samples plant status according to the frequency of variation--less frequent sampling with slow variations and more frequent sampling with increased variations. The method purportedly provides control action economy and good predictability of plant behavior. (Little-Battelle)
W73-12616

GRAPHIC DISPLAYS FOR PROCESS INSIGHT,
R. Toensing.
Control Engineering, Vol 20, No 4, p 47-49, April 1973.

Descriptors: *Design criteria.
Identifiers: *Display systems, Data displays.

General guidelines are given for designing process displays which minimize problems of the man-machine interface. (Little-Battelle)
W73-12617

HEATED SENSORS FOR FLOW MEASUREMENTS,
R. Wasserman, and H. Grant.
Instruments and Control Systems, Vol 46, No 5, p 59-61, May 1973. 4 fig, 4 tab.

Descriptors: *Water temperature, *Flow rates, *Viscosity, *Reynolds number, *Thermal conductivity, Temperature, Electrical equipment.
Identifiers: *Hot wire sensors, *Hot film sensors, Sensors.

Heated sensors consist of electrical probes connected to a bridge circuit which provides a current flow to maintain the temperature of the probe above ambient. By knowing characteristics of the fluid to be measured and the probe, it is possible to measure temperature, viscosity, Reynolds number, thermal conductivity, and mass flow. Where fluid temperature fluctuates, errors in mass flow measurements can be compensated for by computation or by using an additional unheated sensor. Measurement circuits may employ either constant temperature or constant bridges depending on the requirements of the system. Probes are constructed of platinum, tungsten, or platinum-iridium wire of 0.00008 to 0.001 inch diameter or of films of resistance material plated on ceramic or quartz substrates. A comparison of the performance characteristics of wire and film probes in various fluids is given. (Little-Battelle)
W73-12618

AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 05A.
W73-12629

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA,
Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
For primary bibliographic entry see Field 05A.
W73-12630

SELECTIVITY OF TOWED-NET SAMPLERS,
National Marine Fisheries Service, Honolulu, Hawaii. Southwest Fisheries Center.
R. A. Barkley.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 3, p 799-820. 1972. Illus.
Identifiers: Animals, *Nekton, Nets, *Plankton, *Samplers, Selectivity, Towed nets.

The ideal sampler for plankton and nekton is one whose selective characteristics are known to be appropriate to any given problem, so that it catches the right organisms, and rejects others, with known efficiency. A quantitative theoretical analysis of 1 aspect of selectivity, avoidance of towed-net samplers is presented. The theory is evaluated against 3 sets of paired samples obtained by different nets at different speeds to provide absolute and relative tests of its validity. A single sample obtained by 1 net towed at 1 speed is then analyzed to illustrate the procedure. Final evaluation of the theory awaits studies of animal behavior when confronted by a sampler, but the theory provides informative and reasonable interpretations of plankton and nekton catch data, particularly estimates of population abundance and mesh losses, even when behavior of the animals is not known.--Copyright 1973, Biological Abstracts, Inc.
W73-12669

CONVECTIVE GROUND WATER FLOW,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 02F.
W73-12722

MEASUREMENT OF CURRENTS IN THE GREAT LAKES,
Ministry of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 02H.
W73-12741

NEW APPLICATIONS OF GEOPHYSICAL METHODS TO GROUND-WATER PROBLEMS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 02F.
W73-12783

AUGER SOIL SAMPLER FOR HERBICIDE RESIDUES,
Agricultural Research Service, College Station, Tex. Plant Science Research Div.
For primary bibliographic entry see Field 02G.
W73-12794

NOMOGRAPH FOR THE SATURATION PERCENTAGE OF SOIL,
For primary bibliographic entry see Field 02G.
W73-12807

LASER INDUCED FLUORESCENCE IN ALGAE: A NEW TECHNIQUE FOR REMOTE DETECTION,
Sparcom, Inc., Alexandria, Va.
For primary bibliographic entry see Field 05A.
W73-12841

A SIMPLE METHOD FOR RECORDING FISH HEART AND OPERCULUM BEATS WITHOUT THE USE OF IMPLANTED ELECTRODES,
Maine Univ., Orono. Dept. of Zoology.
S. A. Rommel, Jr.
Journal of the Fisheries Research Board of Canada, Vol 30, No 5, p 693-694, May 1973. 1 fig, 4 ref.

Descriptors: *Electrodes, *Fish physiology, *Methodology, Fish, Atlantic salmon.
Identifiers: *Heart rate, *Opercular beats, Electrocardiograms, Anguilla rostrata, American eel, Salmo salar.

A method is described by which heart and opercular beats can be recorded from gently restrained, freely-swimming fish without implanting electrodes. The fish were restrained in soft plastic mesh cages so that the long axis of the body was usually aligned in one direction. Electrodes, consisting of carbon rods with leads to a polygraph, were fastened to either end of the cage. Electronic filtering was used to eliminate low frequency swimming movements and high frequency electrical noises. Atlantic salmon and American eel were used in the tests. The method was usable in waters with resistivities between 4000 ohm-cm and 400 ohm-cm. Best results were obtained in water of about 1000 ohm-cm. Excellent agreement was obtained between the water electrode recording and implanted electrode recordings. The method can minimize fish handling in some physiological experiments. (Mortland-Battelle)
W73-12858

LITHIUM SILICATE SEDIMENTATION TRACER FOR SHOAL DEPOSIT STUDIES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W73-12862

AN IMPROVED AA MICROSAMPLING SYSTEM,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W73-12865

SPECTROPHOTOMETRIC DETERMINATION OF AMMONIA,
Cham/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 05A.
W73-12886

7C. Evaluation, Processing and Publication

CRITICAL REVIEW OF CURRENTLY AVAILABLE WATER QUALITY MODELS,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 06A.
W73-12352

IDENTIFICATION OF WATER RESOURCES PLANNING PROBLEMS IN THE METROPOLITAN AREA OF GREATER SAN ANTONIO AND ITS ASSOCIATED COUNTIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-12354

GEOHYDROLOGY OF THE DOVER AREA, DELAWARE,
Delaware Geological Survey, Newark.
K. D. Woodruff.
Hydrologic Map Series, No 1, 1972. 1 sheet, 1 map, 7 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Delaware, *Maps, Hydrographs, Water wells, Pumping, Drawdown, Groundwater recharge, Rainfall, Aquifers, Chemical analysis.
Identifiers: *Dover (Del).

Total groundwater use in the Dover, Del., area, principally by the city of Dover and the Dover Air Force Base to the southeast, is around 6 to 8 mgd. About 6 to 7 mgd is pumped from the Cheswold aquifer while the remainder comes from the Piney Point Formation. Outside the areas served by public wells, most domestic water comes from the Columbia Formation or the Frederica and Cheswold aquifers. Several large irrigation wells are located where either the Frederica or Cheswold aquifers subcrop directly beneath sands of the Columbia Formation. The Cheswold aquifer is presently being consistently overpumped by about 1-2 mgd and records also indicate that levels in the Piney Point Formation are dropping, particularly during the summer months. Transmissibilities for the Cheswold aquifer range from about 11,000 gpd/ft to the south of Dover to about 33,000 gpd/ft near the middle of Dover. Coefficients of storage range from 0.0003 to 0.006. Transmissibilities in the Piney Point Formation vary from 6,000 gpd/ft north of Dover to 36,000 gpd/ft southeast of Dover. Except in the extreme northern part of the area aquifers beneath the Piney Point contain water having chloride concentrations greater than 250 mg/l. Maps and illustrations describe the hydrogeology and water quality. (Woodard-USGS)
W73-12425

THE COMPUTATION OF TIDES AND CURRENTS IN ESTUARIES AND CANALS,
Massachusetts Inst. of Tech., Cambridge. Hydrodynamics Lab.
For primary bibliographic entry see Field 02L.
W73-12428

HYDROLOGICAL YEAR-BOOK OF ISRAEL, 1970/71.
Ministry of Agriculture, Jerusalem (Israel). Water Commission.
For primary bibliographic entry see Field 02A.
W73-12432

RESERVOIR-YIELD ESTIMATION PROCEDURES,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 04A.
W73-12478

BUREAU OF RECLAMATION PROCEDURES FOR PREDICTING SEDIMENT YIELD,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 02J.
W73-12479

COMPUTER DETERMINATION OF CRITICAL DEPTH CONTROL POINTS IN OPEN CHANNEL FLOW,
Southampton Univ. (England).
For primary bibliographic entry see Field 08B.
W73-12483

A COMPARISON OF RATES OF WATER LOSS THROUGH TRANSPIRATION OF SEVERAL SOUTHERN NEW MEXICO PHREATOPHYTE SPECIES,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 02D.
W73-12497

A TOPOLOGICALLY OPTIMUM RIVER SAMPLING PLAN FOR SOUTH CAROLINA,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W73-12498

TRITIUM MEASUREMENT OF NATURAL WATERS ON OAHU, HAWAII: A PRELIMINARY INTERPRETATION (SAMPLING PERIOD: JULY 1969 TO JUNE 1970),
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W73-12499

CLIMATOLOGY OF RAINFALL PROBABILITIES FOR OAHU, HAWAII,
National Weather Service, Honolulu, Hawaii. Pacific Region.
For primary bibliographic entry see Field 02B.
W73-12587

COMPUTER MODELS OF DELTA GROWTH DUE TO SEDIMENT INPUT FROM RIVERS AND LONGSHORE TRANSPORT,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W73-12592

HORTON'S 1945 STUDY: A CARTOBIBLIOGRAPHY,
Indiana Univ., Bloomington. Dept. of Geography.
M. C. Roberts, and D. A. Cobb.
Geological Society of America Bulletin, Vol 84, No 8, p 2733-2735, August 1973. 1 tab, 1 ref.

Descriptors: *Maps, *Hortons law, *Bibliographies, *Geomorphology, Topography, Terrain analysis, Drainage patterns (Geologic).

All the topographic maps used in Horton's classic 1945 paper are listed. Two obstacles face the researcher in attempting to use Horton's data. In the first place, all of the maps used by Horton have either been revised, replaced by large-scale maps, or are out of print (therefore, current U.S. Geological Survey indexes of topographic maps are of little value because they list only those quadrangles presently available). The second obstacle is that in the paper Horton refers to drainage basins and other physical features for which he does not list the topographical map sources even though he uses them. These obstacles are removed by providing a complete list of all the topographic maps used in the study. (Knapp-USGS)
W73-12596

UPPER CHESAPEAKE BAY WATER QUALITY STUDIES, 1968-1971.
Environmental Protection Agency, Annapolis, Md. Field Office.
For primary bibliographic entry see Field 05A.
W73-12601

MATHEMATICAL MODELS IN ECOLOGY, PROCEEDINGS OF THE 12TH SYMPOSIUM.
For primary bibliographic entry see Field 06A.
W73-12653

MATHEMATICAL MODELING FOR ENVIRONMENTAL POLLUTION CONTROL,
Clemson Univ., S.C.
For primary bibliographic entry see Field 05G.
W73-12711

EVALUATION OF THE WATER RESOURCES OF LEMMON VALLEY, WASHOE COUNTY, NEVADA, WITH EMPHASIS ON EFFECTS OF GROUND-WATER DEVELOPMENT TO 1971,
Geological Survey, Reno, Nev.
For primary bibliographic entry see Field 04B.
W73-12718

HYDROGEOLOGY OF THE CARBONATE ROCKS, FREDERICK AND HAGERSTOWN VALLEYS, MARYLAND,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-12719

WATER QUALITY IN THE MIDDLE FORK FEATHER RIVER, CALIFORNIA, MAY 1970 THROUGH SEPTEMBER 1971,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W73-12720

PREDICTION OF UNSTEADY SALINITY INTRUSION IN ESTUARIES: MATHEMATICAL MODEL AND USER'S MANUAL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-12728

HANDBOOK OF FISH DISEASES FOR VETERINARIANS AND BIOLOGISTS,
For primary bibliographic entry see Field 05C.
W73-12813

THE DEVELOPMENT OF A REGIONAL SYSTEMS ORIENTED WATER MANAGEMENT MODEL: A TOOL FOR POLICY ANALYSIS,
Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.
For primary bibliographic entry see Field 06A.
W73-12839

REAL-TIME INTERACTIVE INSTRUMENTATION,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 07A.
W73-12850

INSTRUMENTAL AND NUMERICAL CONSIDERATIONS FOR ON-LINE INTERPRETATION OF HIGH RESOLUTION MASS SPECTRAL DATA,
Wisconsin Univ., Madison. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-12874

HIGH SPEED A-D CONVERTERS IN A MEMORY TEST SYSTEM,
Inter-Computer Electronics, Inc., Lansdale, Pa.
J. J. Connolly, and M. Rosenbaum.
Computer Design, Vol 12, No 2, p 86, 88, 89, February 1973. 2 fig.

Descriptors: *Date transmission, *Data processing, Digital computers, Automation, Instrumentation, Mechanical equipment, Automatic control.
Identifiers: *Analog to digital converters, Digital sampling systems, On-line computers, Buffer memory systems, Data gathering systems, Computer memory.

A low repetition rate digital sampling system is described in which a buffer storage unit provides a reduction in data rate so that digital samples may be processed and analyzed by an on-line computer. This computer may be either a special-purpose digital processor, or a general-purpose device

wherein digital data sample analysis is accomplished by means of a software program. A block diagram is given of the memory data gathering system using an A-D converter. This system will take five samples of the sense amplifier output at 50-ns intervals, convert the analog value of each sample to a 6-bit digital number, and place these numbers in five storage buffers. The converter has a sampling rate capability of up to 20 million samples/s, accuracy of plus or minus 0.8 percent FS plus or minus 1/2 LSB, and is TTL compatible. A 4-bit delay code defines the 100-ns multiple that must elapse after acceptance of an external convert command before actual sampling of the sense amplifier output signal begins. (Holoman-Battelle)
W73-12891

A METHOD FOR HIGH SPEED BCD-TO-BINARY CONVERSION,
Bendix Corp., Kansas City, Mo.
L. C. Beougher.
Computer Design, Vol 12, No 3, p 53-59, March 1973. 6 fig, 11 ref.

Descriptors: *Methodology, Digital computers.
Identifiers: BCD to binary conversions, *Conversion systems, Computer memory, Converters.

The BCD-to-binary design proposed as a high speed coded number converter can translate an 8-digit BCD number into a 27-bit binary number in 60 ns. The method is sufficiently fast to complete the process within one computer memory cycle of any available digital computer. High speed conversion of the number provides assurance that the input data to the computer will be in binary form at any time computer instructions request it. The design architecture was implemented using Schottky-clamped TTL integrated circuits. A less costly configuration can be obtained by using standard TTL integrated circuits such as the 74181 arithmetic logic unit and 74182 carry-look-ahead generator but results in a sacrifice of conversion speed. When standard TTL logic circuits are used, the converter can be expected to convert an 8-digit BCD number into a 27-bit binary number in approximately 150 ns, which is sufficiently fast for many applications and provides a saving of initial component costs. (Holoman-Battelle)
W73-12892

BOOST A/D RATES WITH STAGGERED OPERATION,
Grumman Aerospace Corp., Moriches, N.Y.
H. Baluta.
Electronic Design, Vol 21, No 4, p 54-57, February 15, 1973. 5 fig, 1 tab.

Descriptors: Design criteria, *Rates, Interfaces, Timing, Design standards, Velocity.
Identifiers: *Digital to analog converters, *Conversion speed, Timing constraints.

The operation of two interleaved a/d converters is discussed in order to clarify the details of interface circuit requirements versus the number of converters used. Conversion speed is doubled by the interconnection of two converters; however, external timing constraints limit the attainable speeds. (Holoman-Battelle)
W73-12893

AN APPROACH TO HYDROGEOLOGIC INVESTIGATIONS OF RIVER ALLUVIUM BY THE USE OF COMPUTERIZED DATA PROCESSING TECHNIQUES,
Oklahoma State Univ., Stillwater. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-12942

FLOW TO WELLS NEAR STREAMS IN THE PRESENCE OF DELAYED YIELD FROM STORAGE AND ANALYSIS OF PUMPING TEST DATA,
Bulgarian Academy of Sciences, Sofia. Geological Inst.
For primary bibliographic entry see Field 04B.
W73-12943

SOURCES OF DATA FOR EVALUATION OF SELECTED GEOTHERMAL AREAS IN NORTHERN AND CENTRAL NEVADA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-12947

A HYDROGRAPHIC ATLAS OF LARGER NORTH CAROLINA SOUNDS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 02L.
W73-12948

HYDROLOGIC RECORDS FOR LAKE COUNTY, FLORIDA: 1971-72,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W73-12949

CLASSIFICATION OF THE COASTAL ENVIRONMENTS OF THE WORLD: PART II. AFRICA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 02L.
W73-12950

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02A.
W73-12953

PUBLICATIONS OF WATER RESOURCES INVESTIGATIONS IN COLORADO AND SELECTED PUBLICATIONS PERTAINING TO COLORADO.
Geological Survey, Denver, Colo. Water Resources Div.
For primary bibliographic entry see Field 02A.
W73-12954

08. ENGINEERING WORKS

8A. Structures

STONE AND WOODCHIP MULCHES FOR EROSION CONTROL ON CONSTRUCTION SITES,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 04D.
W73-12463

STRENGTH ANALYSIS OF CORNER COLUMN-SLAB CONNECTIONS,
Calgary Univ. (Alberta).
E. R. F. Zaghlool, and H. A. R. de Paiva.
J Struct Div, Am Soc Civ Eng, Vol 99, No ST1, p 53-70, Jan 1973. 3 fig, 2 tab, 27 ref, 3 append.

Descriptors: *Columns, *Slabs, *Structural analysis, Reinforced concrete, Shear strength, Structural engineering, Mohr envelope, Mathematical models, Bibliographies, Structural members.
Identifiers: Foreign studies, *Structural concrete, Supports, Bending moments, Plates, Torsion, Axial loads, Ultimate strength design, Theoretical analysis, Comparative studies.

An analytical method is presented for predicting strength of a corner column-slab connection in a flat plate structure subjected to bending moments or combined bending and axial load through the column stubs. The column side to the effective slab depth ratio, r/d, concrete and steel properties, steel configuration near the column-slab interface, and the moment to shear ratio are considered. The ultimate strength method of analysis for the reinforced concrete elements is based on the assumption of an idealized mode of failure. Flexural, torsional, and shear resistance of the idealized slab sections framing into the column was based on recent research into torsional and shear strength of beams. Equilibrium and compatibility are satisfied at ultimate load and the concrete in the compression zone above the head of the failure crack must reach some critical stress condition. Basic assumptions used in the method are discussed and the derivation presented. Validity was determined from comparisons of theoretical predictions with available test results; excellent correlation was obtained. Recommendations for application and a numerical example are given. (USBR)
W73-12465

WELDING OF A NORMALIZED HIGH STRENGTH LOW ALLOY PLATE STEEL OF STRUCTURAL QUALITY,
United States Steel Corp., Monroeville, Pa. Applied Research Lab.
For primary bibliographic entry see Field 08G.
W73-12466

HEURISTIC RANKING AND PRIORITIZING UNDER SUBJECTIVE CONDUCTIONS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 06B.
W73-12470

HYDROLOGICAL RESERVOIR DESIGN USING BASIC SYSTEMS THEORY TECHNIQUES,
Lahmeyer International G.m.b.H., Frankfurt am Main (West Germany).
F. Fahlbusch, F. G. Rohde, and T. C. Muir.
Water Power, Vol 25, No 1, p 18-24, Jan 1973. 7 fig, 1 tab, 19 ref.

Descriptors: *Reservoir storage, *Rainfall-runoff relationships, *Hydrograph analysis, *Reservoir design, Rainfall, Hydrographs, Computer programs, Reservoir operation, Bibliographies, Runoff, Streamflow, Probability, Economic feasibility, Benefit-cost ratios, Model studies.
Identifiers: *Reservoir capacity, Flood hydrographs, Stochastic models, Computations.

A simple approach is presented for solving the problem of designing adequate reservoir storage capacity with available data consisting of a lengthy record of monthly rainfall and a short record of monthly runoff. The procedure permits the synthesis of long streamflow sequences without encountering the problems associated with selection and fitting of suitable models to observed runoff series. This approach is particularly applicable in developing countries where data available is inadequate. Three principal model components used are: (1) COR, rainfall-runoff model, (2) TSA, time series analysis of observed monthly rainfall sequence (synthesis of a long rainfall series), and (3) RES, simulation of reservoir operation. Basic premises and mathematical operations of these components are presented. The models were applied to several river systems and the results compared with observed streamflow data. Experience shows that the required reliability of the target withdrawal is an important factor in determining necessary storage. For a given draft, particularly one approaching the mean inflow, the required storage is extremely sensitive to reliability. For a given reliability, increases in target withdrawal require increasingly larger increases in storage. (USBR)
W73-12471

STRESSES IN THE BODY AND FOUNDATIONS OF PRESTRESSED DAMS,
Roorkee Univ. (India).
R. S. Varshney.
Water Power, Vol 24, No 12, p 445-454, Dec 1972. 10 fig, 3 tab, 14 ref.

Descriptors: Dam construction, *Prestressing, *Stress analysis, *Dam design, Dam foundations, Dams, Arch dams, Concrete dams, Uplift pressure, Hydrostatic pressure, Anchors, Stress distribution, Buttress dams, Gravity dams, Rock foundations, Shear strength, Grouting, Elastic theory, Prestressed concrete.
Identifiers: India, Foreign studies, *Dam stability, Construction methods, Hydraulic structures, Stressing cables, Stress distribution.

Since the first application of the prestressing technique to Cheurfas Dam, Algeria, in 1937, use of cable prestressing in dams has grown rapidly. The technique has been applied successfully to strengthening and raising numerous old dams and to construction of several new dams. To design the most economical sections, an outline of prestressing techniques in dam construction and the analysis of stresses in the dam and the foundation are presented. Studies using the theory of elasticity show that the prestress load is effective for economical design of a dam up to a height of about 80 m for a load of 200 metric tons per meter. Maximum spacing of anchors may be limited to 6.0 m and should be located about 1.5 m from the upstream face. With constant prestress force, horizontal tensile stress will decrease as the depth of the anchorage increases, but with the same depth, cracks may appear with higher prestressing force. Stress coefficients for different locations in the foundation for the internal concentrated load are tabulated. Actual stresses in metric tons per meter squared can be calculated by multiplying the coefficients by the prestressing forces in metric tons per meter and dividing by the depth of anchor d in meters. (USBR)
W73-12475

RESERVOIR-YIELD ESTIMATION PROCEDURES,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 04A.
W73-12478

HIGH STRENGTH BOLTED GALVANIZED JOINTS,
Carleton Univ., Ottawa (Ontario).
For primary bibliographic entry see Field 08G.
W73-12489

STRESS DISTRIBUTION AROUND A TUNNEL SITUATED IN A LAYER UNDER THE ACTION OF GRAVITY,
National Technical Univ., Athens (Greece).
For primary bibliographic entry see Field 08E.
W73-12490

MATHEMATICAL SIMULATION OF THE TURBIDITY STRUCTURE WITHIN AN IMPOUNDMENT; HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12562

WAVE DAMPING EFFECTS OF FIBROUS SCREENS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-12564

OUTLET WORKS STILLING BASIN FOR TALLAHALA DAM, TALLAHALA CREEK, MISSISSIPPI; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12568

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES, HYDRAULIC LABORATORY IVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 04A.
W73-12569

NAVIGATION CHANNEL IMPROVEMENT, GASTINEAU CHANNEL, ALASKA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
F. A. Herrmann, Jr.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-9, November 1972. 46 p, 8 tab, 68 photo, 49 pl.

Descriptors: *Channel improvement, *Hydraulic models, *Shoals, *Alaska.
Identifiers: *Navigation channels, *Gastineau Channel (Alas).

A model study was conducted to determine the best means of resolving the shoaling problem in the Gastineau Channel, Alaska. The model, constructed to linear scale ratios of 1:500 horizontally and 1:100 vertically, reproduced about 7 miles of Gastineau Channel from Fritz Cove on the west to 1 mile north of Juneau, Alaska, on the east. It was equipped to reproduce and study prototype tides, tidal currents, freshwater inflow, and shoaling. The shoaling tests were conducted using granulated plastic to simulate the natural sediments, and a technique was developed to properly reproduce the prototype shoaling pattern and distribution. It was determined from the model tests that any one of several impermeable dikes with a top elevation above high water and located along the north side of the navigation channel would reduce shoaling by 80 to 85 percent. Diversion of Fish Creek away from the navigation channel would result in an additional 5 percent reduction. The shortest dike tested (plan 4) was 17,250 ft long, and the shoaling reduction for this plan was essentially the same as that for longer dikes. (WES)
W73-12571

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08B.
W73-12572

REPORT ON ARKANSAS VALLEY CONDUIT FOR SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT, FOUR CORNERS REGIONAL COMMISSION AND U.S. BUREAU OF RECLAMATION.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 04A.
W73-12577

SPILLWAY FOR OAKLEY DAM, SANGAMON RIVER, ILLINOIS-APPENDIX A: TYPE 2 (REVISED) SPILLWAY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
E. S. Melsheimer.
Available from NTIS, Springfield, Va 22151, as AD-754 535 Price $3.00 printed copy; $1.45 microfiche. Technical Report H-70-13, December 1972. 17 p, 1 fig, 9 plate, 4 photo.

Descriptors: *Spillways, *Dams, *Illinois, Hydraulic models, Design flow, Discharge (Water).
Identifiers: *Oakley Dam (Ill).

The plans for the Oakley Dam project, Illinois, were changed by modification of the spillway design. These modifications, involving lowering the elevation of the spillway crest, decreasing the length of the spillway, and extending the gate piers upstream were tested in a hydraulic model. Approach flow conditions with the revised spillway installed were generally satisfactory, although the decrease in spillway height increased the velocity along the abutment wraparounds and increased drawdown and contraction in the end bays of the spillway. The capacity of the spillway was adequate; the maximum discharge of 150,000 cfs was passed at a pool elevation of 661.0 with the original abutments and 661.6 with the proposed design abutments. With the spillway reduced in elevation, better energy dissipation was obtained with two rows of baffle piers on the downstream portion of the apron (type 8 basin) rather than with the chute blocks and one row of baffles with the orininal spillway (type 6 basin). A flow of about 35,000 cfs could be passed through the two bridges below the structure without overtopping the roadway. Riprap having an average stone size of 400 lb was required for a distance of 60 ft downstream of the stilling basin; 15-lb stone should suffice for the rest of the exit channel. Additional protection should be provided at the abutments of the bridge. (Knapp-USGS)
W73-12582

CONSTRUCTION COSTS OF WATER SUPPLY AND SEWAGE NETWORKS IN POLAND--19-61-1970,
Institute of Public Utility Services, Warsaw (Poland).
For primary bibliographic entry see Field 06C.
W73-12703

DIAMOND-BIT RESEARCH PROVIDES BASIC DRILLING PARAMETERS,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 08B.
W73-12764

CATHODIC PROTECTION FOR COATED STEEL PIPELINES,
Colorado Springs Dept. of Public Works, Colo. Water Div.
For primary bibliographic entry see Field 08G.
W73-12765

WELL LOGS CAN INDICATE FORMATION DRILLABILITY,
California Univ., Berkeley.
For primary bibliographic entry see Field 08E.
W73-12769

GUIDE SPECIFICATION FOR CHEMICAL GROUTS.
American Society of Civil Engineers, New York. Committee on Grouting.
For primary bibliographic entry see Field 08G.
W73-12782

8B. Hydraulics

COMPUTING BACKWATER AT OPEN CHANNEL CONSTRICTIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. W. H. Barrett, and G. V. Skogerboe.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9841, p 1043-1056, July 1973. 9 fig, 2 tab, 10 ref, append. AID Contract csd-2460.

Descriptors: *Flow profiles, *Backwater, *Open channel flow, Non-uniform flow, Subcritical flow, Flow around objects, Bridges.
Identifiers: Open channel constrictions.

A subcritical (submerged) flow analysis for open channel constrictions was modified to provide an improved technique for computing the backwater resulting from constrictions. Application of the method to results from model studies provides a more accurate prediction of the effects of a contraction on open channel flow than the methods currently in use. Of particular advantage is the applicability of the proposed technique to any flow condition or regime and its independence of channel slope. (Knapp-USGS)
W73-12415

EXTREME ROUGHNESS OF NATURAL RIVER CHANNEL,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
H. J. Leutheusser, and W. O. Chisholm.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY7, Paper 9831, p 1027-1041, July 1973. 13 fig, 2 tab, 4 ref, append.

Descriptors: *Roughness (Hydraulic), *Stage-discharge relations, Discharge (Water), Backwater, Open channels, Open channel flow, Channel improvement, Hydraulic design.

In the hydraulic design of a channel improvement scheme, special attention is focused on the synthesis of the stage-discharge relationship for the downstream end of the improvement reach. In the absence of more directly applicable information, the design of the tail-water rating curve is based on the roughness characteristics of the river channel. Roughness is deduced from a combination of the high-water mark and flood flow which were recorded during the occurrence of a hurricane over the watershed. Manning roughness coefficient is 0.225 for the channel reach under consideration. This value is larger than corresponding predictions made on the basis of conventional methods for estimating n. (Knapp-USGS)
W73-12416

LONG WAVE PROPAGATION IN IDEALIZED ESTUARY,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-12417

FINAL ENVIRONMENTAL STATEMENT: SMALL BEACH EROSION CONTROL PROJECT, BROADKILL BEACH, DELAWARE.
Army Engineer District, Philadelphia, Pa.

Available from NTIS, Springfield, Va. 22151 as EIS-73-0225-F - Price $3.00 printed copy; $1.45 microfiche. February 1972. 17 p, 1 map.

Descriptors: *Beach erosion, *Erosion control, *Coastal engineering, *Delaware, Project planning, Recreation facilities, Berms, Shore protection, Ocean waves, Storms, Tidal effects.
Identifiers: *Broadkill Beach (Del), *Environmental Impact Statements.

The summer resort of Broadkill Beach is located in Sussex County on Delaware Bay about three miles northwest of Lewes, Delaware. The purpose of the proposed project is to protect the shoreline of Broadkill Beach by providing beach erosion control measures that would result in a recreational beach adequate to satisfy the present and future needs of the area. The problem at Broadkill Beach is the erosion of the beach along Delaware Bay caused by wave action during storms. As a result of this erosion, much recreational beach has been lost, and shore properties are now susceptible to damage from extreme tides and wave action. The plan of improvement, considered most suitable for Broadkill Beach consists of improving 4,500 feet of beach, extending from a point 2,700 feet north of the access road (Route 16) to a point 1,800 feet south of that road by placement of approximately 110,000 cubic yards of suitable sand to provide a berm 50 feet wide at an elevation 10 feet above mean low water, erection of 4,500 feet of sand fence and periodic nourishment of the beach by artificial placement of approximately 40,000 cubic yards of suitable sand every four years. Suitable material for initial fill and periodic nourishment is available from an offshore borrow source. (Woodard-USGS)
W73-12430

EVALUATION OF HYDRAULIC PROPERTIES OF ROCK MASSES INFLUENCED BY MAJOR HETEROGENEITIES,
Golder, Brawner and Associates Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 08E.
W73-12468

GENERALIZED DISCHARGE RELATIONS FOR CUTTHROAT FLUMES,
Colorado State Univ., Fort Collins.
G. V. Skogerboe, R. S. Bennett, and W. R. Walker.
J Irrig Drain Div, Am Soc Civ Eng, Vol 98, No IR4, p 569-583, Dec 1972. 11 fig, 2 tab, 5 ref, 2 append.

Descriptors: Irrigation, Open channel flow, *Discharge measurement, *Water measurement, Drainage, Flow measurement, Flumes, Design criteria, Hydraulic structures, Subcritical flow, Laboratory tests, Discharge coefficient, Fluid mechanics.
Identifiers: *Cutthroat flumes, Hydraulics, Measuring instruments, Parshall flumes, Submerged flow, Free flow.

The Cutthroat flume, a new flume designed to measure flows in flat gradient streams, is simple and economical, operates well under submerged flow conditions, and has low head loss. Initial investigations of the flume were limited to one length of 9 ft with throat widths ranging from 1 to 6 ft, and therefore, were not geometrically similar. To obtain generalized discharge rating curves for geometrically similar flumes, a group was rated under both free flow and submerged flow conditions. Twelve flumes were used in the study–3 flumes lenghts, 1.5, 3, and 4 ft, with 4 different throat widths for each length. In addition, the flume sizes were selected to permit correlations with the initial Cutthroat flume studies. To obtain the most accurate rating, based upon analysis of data scatters of laboratory ratings, flumes with throat width to length ratios between 0.1 and 0.4 are recommended. Because of scale effects, flumes less than 3 ft long are satisfactory only for free flow operations. Experimental flume dimensions are given; free flow and submerged flow coefficients and exponents are tabulated. (USBR)
W73-12474

COMPUTER DETERMINATION OF CRITICAL DEPTH CONTROL POINTS IN OPEN CHANNEL FLOW,
Southampton Univ. (England).
K. V. H. Smith.
Inst Civ Eng Proc, Part 2, Vol 53, p 461-470, Dec 1972. 5 fig, 4 ref.

Descriptors: *Open channel flow, Control structures, *Water surface profiles, *Hydraulics, Computer programs, Water control, Discharge (Water), Gradually varied flow, Fluid mechanics, Open channels, Hydraulic structures, Momentum equation, Equations, Foreign research.
Identifiers: Great Britain, Prismatic channels, *Critical depth, Water surface profiles, Calculations, *Critical velocity.

In open channels with variable geometry, or with discharge varying along the length of the channel, determining the location of a critical depth control point is difficult. A simple computer procedure is presented to locate a critical depth control as a point in a channel where a singularity occurs. With the described procedure, control points can be obtained for a wide range of conditions in open channel flow. This procedure is a modern equivalent of the transition profile method applied to prismatic and nonprismatic channels considering lateral inflow. The prismatic channels have a constant cross section with a defined (although not necessarily constant) invert slope. The nonprismatic channels have a variable cross section, including natural channels not having defined inverts. Gradually varied flow equations and conditions for a critical control for both prismatic and nonprismatic channels are discussed. Computer solutions for both kinds of channels are illustrated. Determining a critical depth control point in a nonprismatic outlet channel from a reservoir is exemplified. (USBR)
W73-12483

CHENA RIVER LAKES PROJECT, ALASKA, PROBLEMS RELATING TO CHANNEL DEVELOPMENT, EROSION, AND BANK AND LEVEE PROTECTION,
Committee on Channel Stabilization (Army).
C. P. Lindner, and G. B. Fenwick.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, March 1973. 24 p, 3 pl.

Descriptors: *Channel improvement, *Erosion, *Flood protection, Bank protection, *Levees, Shoals, *Alaska.
Identifiers: *Chena River (Alas), *Tanana River (Alas), Fairbanks (Alas).

This report is published by the Committee on Channel Stabilization primarily in furtherance of their objective, with respect to channel stabilization, to provide, at the request of field offices, advice on design and operational problems; and to review and evaluate pertinent information and disseminate results thereof. Opinions are given on channel stabilization problems involved in evaluating the several alternate plans for regulating the Chena and Tanana Rivers to provide flood protection for Fairbanks, Alaska. Some of the questions asked the Committee, and answered, were: How successfully can the river be diverted by the method outlined; Is location of the diversion satisfactory; How would the diversion affect the river downstream; What levee maintenance problems are likely to be encountered; Is levee design for Tanana River (braided river) the best possible for this type stream; Is there prior experience with levee construction or bank stabilization on large braided rivers; Will borrowing from the river have an effect on future erosion; What problems are associated with maintaining the pilot channel after construction. (Garrett-WES)
W73-12559

REFLECTION CHARACTERISTICS OF SCREEN WAVE ABSORBERS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
G. H. Keulegan.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Research Report H-73-3, April 1973. 42 p, 17 tab.

Descriptors: *Hydraulic models, *Screens, Waves (Water).
Identifiers: *Screen wave absorbers, *Wave reflection, *Wave absorbers.

Two expressions are derived for the reflected waves from a wave absorber consisting of small mesh screens with the pieces in parallel arrangement and equal distance apart. In deriving one of the expressions, it is assumed that one part of the

observed reflection is due to a reflection from the frontal part of the absorber and the remaining part, to a reflection from the rigid wall at the back. The agreement between observation and evaluation is fair. The other expression is derived empirically. The formula obtained relates the observed reflection from an absorber to the transmission that would have occurred had the wave absorber been used as a filter. The law derived is quadratic and resembles the form given by Goda and Ippen. (WES)
W73-12561

MATHEMATICAL SIMULATION OF THE TURBIDITY STRUCTURE WITHIN AN IMPOUNDMENT; HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
D. G. Fontane, J. P. Bohan, and J. L. Grace, Jr.
U.S. Army Engineer Waterways Experimental Station, Vicksburg, Mississippi, Research Report H-73-2, March 1973. 12 p, 6 tab, 3 pl.

Descriptors: *Mathematical models, *Impoundments, *Turbidity, Computer models, Forecasting, Impoundment, Model studies, Simulation analysis.

The turbidity structure of an impoundment was simulated using a mathematical model capable of simulating physical and chemical characteristics of an impoundment. Turbidity was handled as a conservative chemical substance. The model was used to predict the thermal and turbidity structures of an existing impoundment and was verified with observed data. The model was then used to predict the turbidity structure of a proposed impoundment. The effectiveness of selective withdrawal and, in particular, of a low-level outlet in controlling the turbidity structure of an impoundment was demonstrated. (WES)
W73-12562

WAVE TRANSMISSION THROUGH ROCK STRUCTURES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulic Lab.
G. H. Keulegan.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Research Report H-73-1, February 1973. 56 p, 22 tab.

Descriptors: *Hydraulic models, *Waves (Water), Breakwaters, Jetties.
Identifiers: *Rock structures, Wave transmission.

Application of the energy method leads to a theoretical expression of the coefficient of transmission through a prismatic structure, constructed from rocks of uniform size, for long waves traversing the structure. When the dissipation in the voids is due partly to turbulent forces, the transmissions are expressed by a power formula. The formula is modified by a parametric factor to respond to the conditions met with in the ordinary model studies of the shorter waves. The factor form is determined from observations made with waves of varying periods. The relation of the adapted formula to the resistance of the structures for steady flow is shown. With the reflections not being amenable to an analytical treatment, test results are consolidated in a single curve, irrespective of the rock sizes, with the porosity remaining constant. (WES)
W73-12563

WAVE DAMPING EFFECTS OF FIBROUS SCREENS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Research Report H-72-2, September 1972. 82 p, 18 tab.

Descriptors: *Hydraulic models, *Screens, Waves (Water).
Identifiers: *Wave attenuation, *Fibrous materials.

Expressions are derived for the damping of essentially translatory waves by screens prepared from fibrous materials such as aluminum wool, rubberized hair, and polyurethane foam. The derivations involve either the resistance coefficients or the permeabilities of these materials and these are individually determined. It is found that with the aluminum wool the damping is exponential and yields expressions admitting logarithmic decrements. A comparision is made with the Biesel theory of decay in porous media. With the foams the damping is also exponential; on the other hand, with the rubberized hair the damping is best described in terms of a power formula. (WES)
W73-12564

EFFECTIVE HYDRAULIC ROUGHNESS FOR CHANNELS HAVING BED ROUGHNESS DIFFERENT FROM BANK ROUGHNESS; A STATE-OF-THE-ART REPORT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. G. Cox.
U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-73-2, February 1973. 12 p, 2 tab, 9 pl, 3 app.

Descriptors: *Roughness (Hydraulic), *Open channel flow, *Flow resistance, Roughness coefficient, Mannings equation, Beds, Banks, *Reviews.

This report summarizes two numerical studies, one laboratory experimental study, and one analytical study of flow resistance in rectangular channels having one type or degree of boundary roughness on the bed and a second type or degree of roughness on the sidewalls. The numerical study showed that usual procedures for estimating resistance coefficients for channels of this type are not adequate. The laboratory study indicated that the relations between the effective Manning's n, the sidewall Manning's n, the bed Manning's n, and the channel geometry could be established empirically by extensive laboratory testing. The analytical study proved that laboratory studies using a smooth surface for one of its boundaries had little application to practical design problems. It also showed that the best solution to the problem probably would result by use of hydraulic roughness values to describe the boundary surfaces. The study showed that relatively large errors in estimating the hydraulic roughness effect only minor errors in capacity design. (WES)
W73-12565

EFFECTS OF PROPOSED DOCK EXPANSION AT NEWPORT NEWS ON TIDES, CURRENTS, AND SHOALING; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulic Lab.
R. A. Boland, Jr.
Sponsored by Newport News Shipbuilding and Dry Dock Company, Newport News, Virginia. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-72-10, August 1972. 9 p, 3 tab, 13 photo, 9 pl.

Descriptors: Currents (Water), *Docks, *Hydraulic models, *Shoals, *Tides, *Virginia.
Identifiers: *Navigation channels, *Newport News, James River.

The existing comprehensive fixed-bed model of James River was used for tests to determine effects of first and second phases of proposed shipyard expansion of Newport News Shipbuilding and Dry Dock Company facilities on tides, currents, and adjacent ship channel shoaling. Test results consist of comparable measurements of tide heights, current velocities, and shoaling quantities for existing and proposed conditions. Analysis of results of tests led to conclusions that proposed expansion at Newport News would have no significant effects on current velocities or tidal heights. Maximum increases in current velocities caused by proposed expansion occurred in and adjacent to the navigation channel at bottom depth at sta 2A and 2 where ebb current strengths were increased from about 1.0 to 2.0 fps. Current directions in adjacent reach of James River navigation channel should be improved somewhat after completing the second phase. Shoaling rates in areas adjacent to the dock showed increases ranging from 1.5 to 2.5 times the rates with base conditions installed, with maximum shoaling rate occurring with plan 2 installed. However, quantities involved are small and indicated increases should not be considered a significant deterrent to proposed expansion. (WES)
W73-12566

SEA-LAND NAVIGATION STUDIES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
W. H. Bobb.
Sponsored by Sea-Land Service, Inc., and Port of New York Authority. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-72-9, August 1972. 14 p, 4 tab, 1 photo, 5 pl, 1 app.

Descriptors: *Hydraulic models, Dredging, *New York.
Identifiers: *Containerships, *Navigation channels, Newark Bay (NY) Kill Van Kull (NY), Arthur Kill (NY), *Ship models.

A fixed-bed undistorted-scale model of a portion of Newark Bay, Kill Van Kull, and Arthur Kill and a remotely controlled model of Sea-Land's new SL-7 containership were constructed to a scale of 1:100 and used to determine the adequacy of proposed dredging to provide docking and maneuvering areas to familiarize prospective captains and pilots with the handling characteristics of the new type ship. The Sea-Land model was equipped to reproduce steady state flows in flood or ebb directions and an erratic wind field from three directions. The SL-7 required major portion of the channel in Kill Van Kull and all of it in Newark Bay. Addition of the wind field greatly increased difficulties in rounding Bergen Point, passing through the bridge span, and approaching the Sea-Land wharf. Results of tests in New York Harbor model indicate that shoaling in presently maintained areas south of the bridge will be reduced when the maneuvering area is dredged, but shoaling in the maneuvering area and adjacent channel areas will be greatly increased. None of the plans tested had any significant effect on hydraulic conditions in the problem areas. (WES)
W73-12567

OUTLET WORKS STILLING BASIN FOR TALLAHALA DAM, TALLAHALA CREEK, MISSISSIPPI; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
N.R. Oswalt.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-73-5, April 1973. 8 p , 1 tab, 4 photo, 5 pl.

Descriptors: *Eddies, *Hydraulic models, *Outlet works, Flow, *Mississippi.
Identifiers: *Tallahala Dam (Miss), *Stilling basins.

Tests were conducted on 1:16.6-scale model of Tallahala Creek outlet works stilling basin to determine if eddies or other undesirable flow conditions would exist in the stilling basin. Basin consisted of a horizontal apron 90 ft long and 22 ft wide and was connected to 10-ft-diam outlet by a 56-ft-long transition with sidewalls flared 8.67 on 1. Eddies occurred in original design basin with discharges of 800 cfs or less and expected tailwater elevations. Eddies were eliminated by revising floor and walls of flared transition. Sidewall flare was changed from 8.67 on 1 to 11.83 on 1 and the IV-on-8H downsloping floor was changed to IV-on-6H upslope for a rise of 4 ft and then a downslope with curve following equation x2 ± 238y. Floor was sloped down laterally 1 ft from transition center line to each wall. Spray off baffle blocks occurred with design discharge and minimum tailwater with stilling basin as originally designed. Height of baffle blocks was increased and additional row of blocks was added to prevent this type of action. (WES)
W73-12568

SHOALING CONDITIONS, ST. LOUIS HARBOR, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. J. Franco.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-7, November 1972. 18 p, 17 pl.

Descriptors: *Shoals, *Harbors, *Hydraulic models, Mississippi River, Sediment transport, *Missouri.
Identifiers: *Chain of Rocks Canal, *St. Lous Harbor (Mo).

Purposes of study were to determine causes of shoaling in harbor and docking areas and to develop plans to eliminate or reduce shoaling in these areas and in lower entrance to Chain of Rocks Canal. Model was a movable-bed type, reproducing reach of Mississippi River and adjacent overbank areas between miles 191.0 and 169.9. Some of the results indicated: Shoaling along city front can be expected along the convex side of bends in streams carrying sediment. Conditions in the city front reach are also affected by movement of sediment from the Missouri River and by differences between channel characteristics in reach along city front and those in reach upstream. Improvement along city front can be obtained by closing channel along left side of Mosenthien Island, by extending training structures into channel on right side of Mosenthien Island and channel along city front, and by constructing a lock and dam structure downstream of the harbor area. Shoaling in lower entrance to Chain of Rocks Canal during low flows is caused by sudden expansion in channel width and movement of bottom currents towards approach channel past the end of the trail dike. (WES)
W73-12570

NAVIGATION CHANNEL IMPROVEMENT, GASTINEAU CHANNEL, ALASKA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 08A.
W73-12571

EFFECTS OF SUBMERGED SILLS IN THE ST. CLAIR RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. J. Franco, and J. E. Glover.
U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-72-4, August 1972. 18 p, 5 tab, 7 photo, 20 pl.

Descriptors: *Navigation, *Hydraulic models, Lake Huron, *Michigan.
Identifiers: *Submerged sills, Navigation conditions, *St. Clair River (Mich).

Low lake level experienced in Lake Huron during the early 1960's had a detrimental economic impact on the area. To increase water level in Lake Huron, plans for using submerged sills at the head to St. Clair River were proposed. A fixed-bed, 1:60-scale model was used, reproducing approximately 2.8 miles of St. Clair River and a small section of the lower end of Lake Huron. With the sill arrangements developed, water levels in Lake Huron could be raised by up to 0.75 ft without adversely affecting navigation conditions. A type of sill that would facilitate construction and reduce construction cost could be used without any significant loss in effectiveness. Shoaling along the Canadian shore can be attributed to movement of sediment into that side of the river, the natural tendency for shoaling on the convex side of a river bend, and the effects of the eddy currents. Sills would tend to reduce the size of the eddy and the tendency for shoaling. Some deposition of sediment could occur along the left ends of some of the sills, but any of effectiveness resulting from deposition would be small. (WES)
W73-12572

ESTUARINE NAVIGATION PROJECTS.
Committee on Tidal Hydraulics (Army), Washington, D.C.

Available from NTIS, Springfield, Va. 22151 as AD-756 133, Price $3.00 printed copy; $1.45 microfiche. Technical Bulletin No 17, January 1971. 253 p, 57 plates.

Descriptors: *Navigation, *Tidal waters, *Hydraulic engineering, *Projects, *Inland waterways, United States, Federal Government, Estuaries, Bays, Canals, Dredging, Tidal effects, Currents (Water), Saline water intrusion, Sediment transport, Channel improvement, Harbors, Project purposes, Programs, Reviews, Hydraulic design.
Identifiers: *Estuarine navigation projects (USA), Shoaling.

Information is presented on selected navigation projects in tidal waterways such as inlets, bays, tidal rivers, and canals. Included for each of the projects are description of the waterway and the Federal project, data on the tides, freshwater discharges from upland sources, currents, salinity intrusions, shoaling, and the dredging required to maintain the channels. Specific problems are identified (where applicable) together with statements of the status of solutions of the problems. Available reference sources are listed. The information should have value in the planning, design, and maintenance of projects in waterways having similar characteristics. The order of presentation of the selected projects is clockwise around continental United States, beginning in New England; in addition, one project in Alaska and one in Hawaii are included. (Woodard-USGS)
W73-12575

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 2. NORTH JETTY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va 22151, as AD-748 813 Price $3.00 printed copy; $1.45 microfiche. Technical Report H-72-2, September 1972. 148 p, 2 fig, 122 plate, 5 photo, 4 tab, 1 ref.

Descriptors: *Coastal engineering, *Beach erosion, *Estuaries, *Jetties, *Washington, Harbors, Shore protection, Model studies, Ocean currents, Waves (Water), Tidal effects, Shoals, Sediment transport, Sands, Saline water intrusion, Forecasting, Planning, Evaluation, Navigation, Inlets (Waterways), Hydraulics, Flow characteristics.
Identifiers: *Grays Harbor Estuary (Wash).

This report is the second in a series to be published on the results of model tests on the Grays Harbor estuary, Washington, model conducted for the U.S. Army Engineer District, Seattle. The entrance to Grays Harbor is protected by two converging stone jetties that are about 1.23 miles apart at their outer ends. Between 1907 and 1914, the north jetty was constructed seaward from Point Brown for a distance of about 3.22 miles. The original top elevation was 8.0 ft mean lower low water (mllw). By 1933, the outer 7000 ft had deteriorated to mllw or lower. Between 1940 and 1942, the jetty was rehabilitated to within 850 ft of the original outer end with a top elevation of 16.0 ft mllw. By 1967 the outer 600 ft of the rehabilitated jetty was below mllw. The fixed-bed model of the Grays Harbor estuary was used to determine the effects of several plans for rehabilitation of the north jetty. Determinations were made of effects on hydraulic, salinity, shoaling, and dye dispersion characteristics. Test results consist of current velocity, tidal height, and salinity measurements; shoaling patterns in the entrance area; dye dispersion characteristics; and photographs of surface current patterns. A 650-ft extension to the north jetty would cause only insignificant local changes in current velocities and patterns in the entrance area. (Woodard-USGS)
W73-12581

MAINTENANCE OF THE HUDSON RIVER CHANNEL, NEW YORK, NAVIGATION PROJECT, (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, New York.

Available from NTIS, Springfield, Va. 22151, as EIS-NY-73-007-F; $3.50 printed copy; $1.45 microfiche. June 30, 1972. 12 p.

Descriptors: *Channel improvement, *Dredging, *Navigation, *Projects, *Hudson River, New York, New Jersey, Maintenance, Engineering, Environmental effects, Turbidity, Water quality, Ecology, Water pollution control, Reviews.
Identifiers: *Hudson River Channel, Spoil disposal, *Environmental Impact Statements.

The Hudson River Channel, New York, Navigation Project includes several phases that deal with environmental, economic, social, and safety aspects. Maintenance dredging of the Hudson River Channel is an existing Federal navigation project. The cahnnel is located in the Hudson River between New Jersey and New York City. The project was authorized by the River and Harbor Acts. It provides for: a channel 45 ft deep and 2,000 ft wide in the area of the Upper New York Bay to W. 40th Street, Manhattan, and 48 ft deep and 2,000 ft wide to 59th Street for a total length of approximately 6 miles; a channel, 40 ft deep for the full width of the river, extending from deep water in Upper New York Bay off Ellis Island to W. 59th Street, Manhattan, for a length of approximately 6 miles; and a channel, 30 ft deep, 750 ft wide, along the Weehawkin-Edgewater waterfront, for a length of 5 miles. (Woodard-USGS)
W73-12588

CONTROL OF UNDERSEEPAGE BY RELIEF WELLS, TROTTERS, MISSISSIPPI; APPENDIX K: 1969 PUMPING TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. C. Trahan.
Available from NTIS, Springfield, Va. 22151 as AD-756 208 - Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum No 3-341, September 1970. 31 p, 5 fig, 8 plate, 3 tab.

Descriptors: *Seepage control, *Levees, *Mississippi River, *Underseepage, *Wells, Dewatering, Pumping, Water yield, Aquifers, Well data, Drawdown, Data collections, Hydrologic data, Engineering.

Identifiers: *Trotters (Miss), Relief wells.

The experimental relief well system installed in 1950 along the landside tow of the Mississippi River main line levee on the east bank at Trotters, Miss, (levee mile 54), is described in the main report to which this is an appendix. The well system was installed in order that information on the performance of relief wells over an extended period of time could be obtained. The relief well system consists of thirty 6-inch ID, wooden wells, on 50-ft centers, located parallel to, and 387 ft landward of the levee center line (just landward of the tow of the seepage berm). The well screens penetrate about 50% of the aquifer thickness and are surrounded by 6-inch-thick gravel filters. This report (Appendix K) presents well cleaning operations and pumping tests conducted in 1969. The well pumping test data were analyzed in order that the yields of the pump-tested wells could be compared with those obtained after installation. Photographs of well screens obtained in 1969 with the borehole TV camera are included for several selected wells. The specific yields for the 1950 pumping tests and all subsequent tests are tabulated. (Woodard-USGS)
W73-12597

SIMPLIFIED SOLUTION FOR DECREASING FLOW IN WELLS,
California Univ., Davis. Dept. of Irrigation.
G. Aron, and V. H. Scott.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 5, No HY5, p 1-12, September 1965. 8 fig, 2 tab, 5 ref, append.

Descriptors: *Aquifer charastics, *Hydraulics, Wells, *Mathematical studies.
Identifiers: Mathematical models, Mineral content, Piezometric surface.

The development of truly exact formulas or methods to describe the hydraulics of nonsteady groundwater flow is an extremely complex task. Even in the most sophisticated approaches, factors such as heterogeneity of the aquifer material, effect of mineral content on permeability, and lag in the response of piezometers to changes of the piezometric surface are neglected or highly simplified. Mathematical methods are used to demonstrate that even if the discharge, Q, from a well decreases with time, the drawdown h, at any time and at any distance from the well can be expressed by Jacob's formula. The proposed procedure should not result in an error of more than 5% to 10% in the computation of transmissability or drawdown, or 20% to 30% in the computation of the storage coefficient. (Campbell-NWWA)
W73-12759

SAND CONTROL - 3. CHEMICAL CONSOLIDATION,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 08G.
W73-12760

HERE'S A NEW SAND PACK METHOD,
Halliburton Services, Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W73-12761

MICELLAR SOLUTIONS STIMULATE WELLS,
Amoco Production Co., Tulsa, Okla.
D. L. Dauben, and H. R. Froning.
Oil and Gas Journal, Vol 70, No 38, p 72-78, 83, September 1972. 6 fig, 3 tab, 3 ref, append.

Descriptors: Wells, *Oil wells, *Injection wells, Chemical reactions, Oil industry, *Water chemistry, *Surfacants.
Identifiers: *Well stimulation, Well redevelopment, *Fluid-flow rates, Thermodynamic equilibrium.

Micellar solution treatment of selected injection and production wells can improve fluid-flow rates by removing residual oil saturations, organic deposits, trapped water or emulsions from the vicinity of the well bore. Micellar solutions (also called microemulsions) are composed of a hydrocarbon, water, a surfacent and a cosurfacant. The surfacent and cosurfacent act as coupling agents to solubilize two otherwise immiscible liquids by encapsulating either water into oil or oil into water. Those solutions are homogeneous and single phase in appearance and displacing ability. Properly mixed they exhibit good miscibility with various crude oils and with water, low and high temperature stability, and an acceptable tolerance to salt (NaCl) content variations. Careful selection of the wells to be treated, consideration of the mixture to be used with respect to the intended purpose, volumes injected, and injection procedures are critical to treatment success. Key factors for the design, application and evaluation of micellar treatment are described. (Hunt-NWWA)
W73-12762

DIAMOND-BIT RESEARCH PROVIDES BASIC DRILLING PARAMETERS,
Mobil Research and Development Corp., Dallas, Tex.
T. B. Dellinger, and B. J. Livesay.
Oil and Gas Journal, Vol 70, No 38, p 86-90, 95, September 1972. 6 fig, 22 ref.

Descriptors: Drilling, *Well drilling, Wells, Rotary drilling, Drilling equipment, Analytical techniques, Computers, Hydraulics, *Regression analysis.
Identifiers: *Diamond drill bits, *Hydraulic lift, *Fluid velocity.

Diamond-bit drilling has developed through the years with very little technical or theoretical guidance. Although mining-type diamond coring can be traced back to 1862, oil field-type operations didn't begin until 1921. Since there was little knowledge of the relationships between factors controlling the drilling characteristics of diamond bits, a study was performed to supply some of these relationships. A comprehensive examination is presented of the fundamental relationships of penetration rate, bit weight, rotary speed, torque and flow rate, and hydraulic lift. Formulae are presented to relate penetration rate to various combinations of variables. (Hunt-NWWA)
W73-12764

LEACHING OF CEMENT FROM A CONCRETE PILE SECTION BY GROUNDWATER FLOW,
Cementation Co. Ltd., London (England).
For primary bibliographic entry see Field 08F.
W73-12766

RATIONAL DESIGN OF WELL SCREENS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
S. P. Garg, and J. Lal.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97A, No IR1, p 131-147, March 1971. 10 fig, 7 ref, 2 append.

Descriptors: *Aquifer characteristics, Permeability, *Hydraulics, Wells, Equipment, *Well screens, Design flow.
Identifiers: *Mathematical analysis, *Entrance velocity, Piezometric heads.

Optimum and economical utilization of ground water involves determination of the depth to which the hole should be bored, selection of a suitable well screen with or without gravel pack, and selection of a suitable pumping unit. While the techniques for boring a well have improved considerably and better screens, as well as pumps have evolved, the progress of improvements in well screen design to conform with the aquifer has been slow. The design of a well which involves the determination of the correct screen size, its length, number and character of openings is still based on empirical criteria. An analytical and experimental study of well screen behavior is presented. General equations describing the hydraulics of well screens are presented in which aquifer permeability, well-screen friction, and other factors have been considered. These equations agree with experimental results and criteria for the design of well screens are presented. (Hunt-NWWA)
W73-12771

BACK-SURGE TECHNIQUE IMPROVES WELL COMPLETIONS,
R. E. Snyder.
World Oil, Vol 172, No 1, p 72-73, January 1971. 2 fig.

Descriptors: *Wells, Oil wells, Oil industry, Aquifer characteristics, *Flow characteristics, Hydraulics.
Identifiers: *Well development, Epoxy injection, *Controlled pressure surge.

Shell Oil Co. has improved productivity on well completions and increased workover success with new tools and methods which are designed to give a controlled pressure surge into the well from the formation to remove perforation restrictions and plugging. The basic goal is to provide the cleanest possible avenue between the well bore and the formation to enlarge the effective wellbore for maximum natural flow, clean all perforations to more effectively inject sand consolidation chemicals or efficiently distribute gravel packing material, open all perforations to acid stimulation, without fracture treatment, to expose entire pay zone. The back surge methods and tools discussed have improved consolidation jobs by assuring open perforations, and thereby reducing epoxy injection pressures, and allowing proper mechanical gravel packing. (Campbell-NWWA)
W73-12773

WASTE DISPOSAL WELL PERFORMANCE,
Monsanto Biodize Systems, Inc., Great Neck, N.Y.
For primary bibliographic entry see Field 05E.
W73-12779

THE DESIGN AND OPERATION OF DEEP--WELL DISPOSAL SYSTEM,
Chemstrand Corp., Pensacola, Fla. Utilities Assistance Group.
For primary bibliographic entry see Field 05E.
W73-12780

THE DISPOSAL OF WASTEWATER UNDERGROUND,
For primary bibliographic entry see Field 05E.
W73-12781

CHANNEL EROSION SURVEYS ALONG PROPOSED TAPS ROUTE, ALASKA, JULY 1971,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 02J.
W73-12957

8C. Hydraulic Machinery

THE MULTIPURPOSE DEVELOPMENT OF THE RIVER RHONE VALLEY,
Compagnie Nationale du Rhone, Lyon (France).
For primary bibliographic entry see Field 04A.
W73-12467

AN ELECTRIC CONVERSION FOR MECHANICAL HYDRAULIC GOVERNORS OF WATER WHEEL TURBINES,
Bureau of Reclamation, Denver, Colo.
C. L. Clemans.
Rep REC-ERC-72-29, Sept 1972. 27 p, 19 fig, 3 ref, append.

Descriptors: *Governors, Mechanical equipment, Performance, Control, Velocity, Research and development, *Hydraulic turbines, Coordination, *Electronic equipment, Power system operations, Testing procedures, On-site tests.
Identifiers: *Synchronous machines, Power system stability, Interconnected systems, Sensitivity, Control equipment, Circuits.

A conversion system for upgrading performance of conventional mechanical governors for hydraulic turbines has been developed. The conversion retains the proven long-term stability of the ball head speed reference but replaces the dashpot function with derivative terms from an independent frequency sensor. The result upgrades the governor system from temporary droop type to a higher order derivative-proportional-integral type. Installation is simple. All original mechanical apparatus is retained for startup and standby; control can be transferred instantly. Advantages are higher sensitivity to small system speed deviations and faster, smoother response to system load control. (USBR)
W73-12469

LARGE HYDRAULIC GATES AND VALVES IN THE SNOWY MOUNTAIN SCHEME--A REVIEW OF PRACTICE,
Snowy Mountains Hydro-Electric Authority, Cooma (Austrailia).
A. N. G. Bray.
Inst Eng, Aust, Mech Chem Eng Trans, Vol MC8, No 1, p 37-43 May 1972. 7 fig, 1 ref, disc.

Descriptors: *Hydraulic gates, *Hydraulic valves, Hydraulic machinery, Hydraulic design, Automatic control, Gate hoists, Evaluation, Construction materials, Performance, Installation, Spillway gates, Radial gates, Butterfy valves, Stainless steel, Operation and maintenance, Reviews, *Hoisting machinery, *Australia.
Identifiers: Snowy Mountains Scheme (Australia), Policies, Foreign construction.

Hydraulic gates and valves constitute the basic control elements and are a prominent feature of the Snowy Mountain Scheme, which has been put into operation over the past 20 yrs. The general policies are reviewed and the effectiveness of the philosophies used are assessed. Gates and valves used in the main hydraulic systems of the scheme are listed. Trends in application of spillway gates, butterfly valves, gate hoists, and automatic gates are discussed. Records of serious malfunctions that have occurred, observations on significant developments in materials and on general trends during construction of the scheme are given. The successful construction and operation of the scheme suggests that sound practives have been used, and the experience gained has received recognition in Australia and other countries. (USBR)
W73-12476

ENERGY METHOD FOR COMPUTING THE AMPLITUDE OF VIBRATION OF CONDUCTOR BUNDLES DUE TO WAKE EFFECT,
Politecnico di Milano (Italy). Istituto di Meccanica Applicata.
G. Diana, and M. Gasparetto.
Eneg Elettr, Vol 49, No 8, p 532-539, Aug 1972. 10 fig, 7 ref.

Descriptors: *Transmission lines, Wind velocity, *Bundled conductors, Frequency, *Energy, Analytical techniques, Foreign research, Computer programs, Flow around objects.
Identifiers: Aerodynamic forces, Italy, *Vibration (Aeolian), *Wind (Meteorology), Amplitude, Electric conductors, Wakes, Galloping conductors, Harmonies, Motion, Computation, Mathematical analysis.

The phenomenon responsible for large amplitude vibrations in bundled conductors of transmission lines is described. A method is developed for computing energy introduced by the wind when a cylinder is moving in a wake of another cylinder. From previous studies, a deduction was made that the phenomenon is characterized by an elliptical motion of the cylinder in the wake, though a mathematical model to explain this type of motion is difficult to determine. Starting with this elliptical motion concept, aerodynamic forces acting on the cylinder were computed. Knowing the energy introduced by the wind, the amplitudes of vibrations caused by the wake effect in bundled conductors can be computed. Results indicate: (1) the energy is primarily introduced by a drag variation and the lift has a negligible effect; and (2) the energy introduced in a cylinder vibrating in a wake of another cylinder is perceptible only at very low frequencies, this justifying low frequency vibration occurring in a bundled conductor system. (USBR)
W73-12480

GUIDE FOR THE DESIGN OF ALUMINUM TRANSMISSION TOWERS.
American Society of Civil Engineers, New York. Task Committee on Lightweight Alloys.

J Struct Div, Am Soc Civ Eng, Vol 98, No ST12, p 2785-2801, Dec 1972. 2 fig, 2 tab, 11 ref, 3 append.

Descriptors: Structural engineering, Loads (Forces), Aluminum alloys, *Transmission towers, Aluminum, Towers, *Structural design, Stress, Buckling, Shear, Mechanical properties, Design criteria, Structural members, On-site tests.
Identifiers: *Aluminum towers, Fasteners, Torsion, Ultimate loads, Bolted joints, Fabrication, Bolts.

The ASCE Task Committee on Lightweight Alloys has prepared a guide for designing transmission towers for all voltage levels, constructed from aluminum alloy 6061-T6. Loading or overload factors, clearances or other electrical requirements, suitability of tower configuration or type, guys, footings, or anchors, are not discussed, as these are considered to be outside the scope of this guide. Analysis of the tower, subjected to the desired combination of ultimate loads, for the forces and, moments in the parts of the tower, is presupposed and suitable sizes of members and fasteners to carry these ultimate loads are established. Fabrication is discussed sufficiently to ensure realization of the designer's intentions. Test methods are discussed only to ensure validity of the tests. All designs are subject to the final scrutiny of full-scale tower tests. The guide should be considered as a means of designing a tower that will sustain specified ultimate loads without significant permanent deformation. (USBR)
W73-12485

TURBINE DESIGN AND PERFORMANCE FOR THE MERSEY-FORTH HYDRO POWER DEVELOPMENT,
Hydro-Electric Commission, Tasmania.
G. J. Causo .
Inst Eng, Aust, Mech Chem Eng Trans, Vol MC8, No 1, p 31-36, May 1972. 11 fig, 2 tab, 9 ref.

Descriptors: *Hydraulic turbines, Draft tubes, Hydraulic machinery, Francis turbines, Pelton turbines, Prototype tests, Foreign projects, Water hammer, *Guarantees, Governors, Prototype tests, *Australia, *Model studies.
Identifiers: Tasmania (Australia), Turbine efficiency, Load rejection, *Performance tests, Spiral cases, Kapla turbines, Water column separation, Acceptance tests.

The Mersey-Forth Hydroelectric development in Northern Tasmania comprises 7 single unit power stations, with a total installed capacity of 308 mw. Four aspects of turbine design and performance discussed are: (1) use of models as the basis for performance guarantees and the allied control of prototype similarity; (2) elimination of conventional governor on a turbine with long tunnel and penstock system; (3) use of a spiral case having unusually small dimensions for a Kaplan turbine and resulting advantages; (4) use of air to avoid adverse effects from water column separation on a turbine with a long pressure tailrace. Model and prototype tests are presented. Regardless of turbine manufacture, all power stations are equipped with ASEA/KMW electrohydraulic governors, simplifying maintenance and permitting adaptation of centralized control. (USBR)
W73-12486

VERTICAL DYNAMIC RESPONSE OF EMBEDED FOOTINGS,
Bureau of Reclamation, Denver Colo.
D. A. Tiedemann.
Report REC-ERC-72-34, Sep 1972. 22 p, 20 fig, 3 tab, 26 ref.

Descriptors: *Seismic Studies, Foundation investigations, Soil investigations, *Seismic properties, *Soil dynamics, Resonance, Soil physical properties, Foundations, Towers, Bibliographies.
Identifiers: Resonant column test, Pacific Northwest-Southwest Intertie, Fort Thompson-Grand Isld Trans Line, Anchored footings, In situ test, Auger-type footings, Vibrators (Mechanical), Pressed plate footings, Dynamic tests, Belled footings, Natural frequency, Footings, Damping.

Field tests were conducted with vibrators on prototype embeded transmission tower footings in 2 different soils to determine their vertical mode dynamic response characteristics. One test was on a belled-auger footing in a soft, saturated clay. The remaining tests were on anchor bar, screw auger, and single- and double-pressed plate footings in low-density dune sand. Also, in situ wave velocity measurements and laboratory resonant column tests were conducted to determine dynamic properties of the soils. Response curves obtained for the belled-auger footing were compared with responses calculated using the half-space theory and the lumped parameter method. Results obtained using the half-space theory differed considerably from measured values. Lumped parameter results indicated that the method was applicable; however, additional testing is needed to further define the effects of embedment on the mass, spring, and damping constants. Dynamic properties of the dune sand determined by in situ velocity measurements, resonant column tests, and empirical relationships were in very close agreement. (USBR)
W73-12487

8D. Soil Mechanics

BUFFALO CREEK DAM DISASTER: WHY IT HAPPENED,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 04C.
W73-12411

SIMPLIFIED CALCULATION OF EMBANKMENT DEFORMATIONS,
Sydney Univ. (Australia).
H. G. Poulos, J. R. Booker, and G. J. Ring.
Soil Found, Vol 12, No 4, p 1-17, Dec 1972. 18 fig, 1 tab, 5 ref, append.

Descriptors: *Settlement (Structural), *Elastic deformation, Graphical analysis, Structural behavior, *Embankment, *Earth dams, Deformation, Elastic theory, *Rockfill dams, Stress analysis, Consolidation, Soil pressure, Soil mechanics, Dam construction.
Identifiers: *Vertical displacements, *Horizontal displacements, Foreign studies, Horizontal movement, Calculations, Displacements, Finite element method.

A simple method is described for obtaining the observed displacements in an embankment or earth dam during the following incremental construction. The method calculations horizontal and vertical displacements and stresses by obtaining coefficients from graphs and using these coefficients in equations. Knowledge of the deformation performance of embankments is important in determining whether future performance will be satisfactory. Several solutions are presented for the displacements and stresses within a homogeneous embankment resting on a rough rigid base, and application of these solutions to practical problems involving nonhomogeneous embankments and consolidation movements is discussed. For a rockfill embankment, comparisons of predicted settlements, observed values, and values predicted from a finite element analysis suggest that the proposed simple method is useful for obtaining rapid estimates of embankment deformations. (USBR)
W73-12473

TIME EFFECTS ON DYNAMIC SHEAR MODULUS OF CLAYS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02G.
W73-12477

BEARING CAPACITY OF FOOTINGS IN PLANE STRAIN,
Colorado Univ., Boulder.
H-Y, Ko, and L. W. Davidson.
J Soil Mech Found Div, Am Soc Civ Eng, Vol 99, No SM1, p 1-23, Jan 1973. 10 fig, 4 tab, 28 ref, 2 append.

Descriptors: *Foundation bearing tests, Laboratory tests, Foundation failure, Soil mechanics, Theoretical analysis, Bearing strength, Foundations, Bibliographies.
Identifiers: *Continuous footings, Plane strain, Foundation models, *Bearing capacity, *Footings, Sands, Roughness, Smoothness, Bearing pressure, Internal friction, Ultimate loads, Test results, Comparative studies, Loading tests.

An experimental program to study plane strain bearing capacities of model strip footings on dense sand is described. The model footings tested (1) were either 3 by 4 in. or 6 by 4 in. in plan (test box was 4 in. wide) and (2) had a smooth (glass) or rough (sandpaper) base. Test results showed plane strain conditions must be maintained in the test box, as deflections of the walls can cause a significant reduction in the ultimate bearing capacity and can allow lodging of sand grains between the footing and walls. Results also show that ultimate bearing capacities for rough footings are only 10% higher than those for smooth footings; thus, Meyerhof's recommendation that 1/2 (N sub gamma) be used for smooth footings is not substantiated. Sokolvski's method of solving the plasticity problem, as illustrated through the scaling procedure developed by Ko and Scott, produces the most accurate estimate of smooth footing bearing values and appears to give a slightly conservative estimate of rough footing bearing values. Use of internal friction angles calculated from triaxial tests as compared to plane strain tests is also discussed. (USBR)
W73-12484

VERTICAL DYNAMIC RESPONSE OF EMBEDED FOOTINGS,
Bureau of Reclamation, Denver Colo.
For primary bibliographic entry see Field 08C.
W73-12487

8E. Rock Mechanics and Geology

EVALUATION OF HYDRAULIC PROPERTIES OF ROCK MASSES INFLUENCED BY MAJOR HETEROGENEITIES,
Golder, Brawner and Associates Ltd., Vancouver (British Columbia).
J. C. Sharp, Y. N. T. Maini, and T. L. Krekke.
Paper, 14th Symp Rock Mech, Penn State Univ, University Park, June 1972. 21 p, 9 fig, 10 ref.

Descriptors: *Heterogeneity, *Tunnel construction, *Faults (Geologic), Engineering geology, Groundwater movement, *Variability, *Hydraulic properties, Foundation investigations, Hydraulic conductivity, Tunnels, Seepage, Tunneling, Excavation, Slope stability, Piezometers, Rock mechanics, Base flow, Hydrogeology.
Identifiers: Hydraulic pressure tests, *Rock slope stability, In situ tests, Permeability tests.

Natural geologic processes generally cause heterogeneities (faults, sedimentary layers, and solution channels) in rock masses that can have a major influence on ground-water flow if the heterogeneities are continuous. Heterogeneities can be either permeable (water carrier) or impermeable (water barrier) relative to the rock mass and can be helpful or hazardous relative to slope stability, foundation, and tunneling situations. For slope stability under drawdown conditions, an impermeable clay seam running parallel to the slope can prevent ground-water pressures from dissipating, and lead to failure. In excavations and tunnels, permeable faults can allow costly water inflows, whereas, water trapped behind an impermeable fault or seam can burst suddenly into an excavation. In predicting the influence of heterogeneities, their areal extent and hydraulic conductivity relative to the surrounding rock are needed. A tunnel construction example is presented wherein an impermeable fault with a 250-ft head acting upon it was detected by piezometer measurements. A differential pressure test to evaluate expected flow across a fault is described. (USBR)
W73-12468

STRESS DISTRIBUTION AROUND A TUNNEL SITUATED IN A LAYER UNDER THE ACTION OF GRAVITY,
National Technical Univ., Athens (Greece).
P. S. Theocaris, and E. Koroneos.
Rock Mechanics, Vol 4, No 3, p 140-154, Nov 1972. 10 fig, 17 ref.

Descriptors: *Tunnels, *Tunnel pressures, Rock mechanics, Gravity, Stress, Stress analysis, *Tunnel design, Foreign research, Bibliographies, Elastic deformation, Strain, Laboratory tests, Model studies, Testing procedures.
Identifiers: Moire pattern, Greece, Experimental models, *Stress distribution, Displacement, Rock pressures, Test results, Underground openings.

A laboratory investigation determined the stress distribution around a circular tunnel caused by the forces of gravity. Tests were made on a model of a strongly plasticized epoxy polymer. Deformation of the 1- by 14- by 31-cm model was achieved by the inversion method, in which the model was freely suspended from the one extremity and left to deform by its own weight. The model simulated a circular tunnel surrounded by a narrow vertical layer loosely connected with neighboring layers. The projected image Moire method was used for measuring displacements. From the displacement, strains and stresses were calculated. Conclusions are that: (1) the stress field distrubance caused by the tunnel opening extends outward for 2 tunnel diameters; (2) maximum normal stresses appear at the springlines, invert, and crown of the tunnel; (3) tangential stress at the walls can increase to 3 times the value for the corresponding layer with no tunnel opening; (4) the tunnel has a strong influence on shear stresses; and (5) actual stress distribution around tunnels should be thoroughly examined. (USBR)
W73-12490

WAVE TRANSMISSION THROUGH ROCK STRUCTURES; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulic Lab.
For primary bibliographic entry see Field 08B.
W73-12563

GEOLOGY OF NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 02F.
W73-12579

WELL LOGS CAN INDICATE FORMATION DRILLABILITY,
California Univ., Berkeley.
W. H. Somerton, and S. El-Hadidi.
World Oil, Vol 173, No 7, p 55-56, December 1971. 1 fig, 16 ref.

Descriptors: *Wells, *Well drilling, Borehole geophysics, Core logging, *Logging, Lithologic logs.
Identifiers: *Sonic transit time log, Sonic velocity, *Rock drillability.

Recent studies of well logs indicated that the resistance of rock to drilling can be determined from sonic transit times and a companion log that provides mineralogical information about the formation being penetrated. A relationship between penetration rate and lithology logs is conspicuous. Correlation between rate of penetration and logs showing variations in physical properties is impossible without accounting for drilling condition variations. Presented are two formulae for relating drilling strength to standard drilling variables so that a correlation between log data and drillability can be established. (Hunt-NWWA)
W73-12769

BACK-SURGE TECHNIQUE IMPROVES WELL COMPLETIONS,
For primary bibliographic entry see Field 08B.
W73-12773

8F. Concrete

TESTS OF SELECTED INSULATING MATERIALS FOR MASS CONCRETE,
Army Engineer, Waterways Experiment Station, Vicksburg, Miss.
E. C. Roshore, and H. T. Thornton, Jr.
Available from NTIS, Springfield, Va 22151 as AD-756 113 Price $3.00 printed copy; $1.45 microfiche. Technical Report C-70-4, September 1970. 19 p, 1 fig, 4 tab, 2 ref.

Descriptors: *Engineering structures, *Structural analysis, *Concrete testing, *Thermal expansion, *Thermal insulation, Laboratory tests, Temperature, Winds, Moisture, Weathering, Evaluation, Design criteria.

During the early ages of mass concrete construction, the interior of the concrete mass can be at temperatures well above freezing while the bulkhead and lift surfaces are being subjected to sub-

freezing temperatures. This condition can result in thermal cracking of the concrete in mass structures. Various types of materials were investigated for insulating mass concrete. The physical and thermal properties of the selected materials were determined under a variety of conditions in the laboratory. The overall heat-transfer characteristics of the materials were determined by using them to insulate standard 2-ft concrete cubes under different temperature, wind velocity, and moisture conditions in the laboratory. Thermal gradient data were developed using both insulated and uninsulated cubes. Outdoor weathering tests were conducted and the insulating properties of several of the materials was tested under field conditions on rough horizonatal and vertical surfaces. Only one of the materials tested is considered satisfactory for the long-term field insulation of mass concrete structures; four materials are considered satisfactory for short-term insulation (15 to 20 days) in the field; two of the materials are not considered satisfactory for either short- or long-term field use. The foamed-in-place insulating material adheres satisfactorily to both horizontal and vertical concrete surfaces under both wet and dry conditions and can be removed without great difficulty. However, this type of material has a pressure buildup in vertical forms caused by self-restriction of upward movement of the foam. (Woodard-USGS)
W73-12431

LEACHING OF CEMENT FROM A CONCRETE PILE SECTION BY GROUNDWATER FLOW,
Cementation Co. Ltd., London (England).
J. W. Farmer.
Civil Engineering and Public Works Review, Vol 64, No 745, p 457-458, May 1969. 4 fig, 2 tab, 3 ref.

Descriptors: Aquifer characteristics, Permeability, *Cement, Hydraulics, *Subsurface drainage, *Groundwater movement, Porosity.
Identifiers: *Critical erosion velocity, Velocity of seepage flow, *Pore space, Hydraulic gradients.

Inspection of cast in situ bored piles has revealed bands of concrete containing honeycombed areas which have been attributed to leaching of cement from the fresh concrete by ground water flow. Two types of groundwater flow are normally encountered in piling works in permeable ground: sub-horizontal flow due to hydraulic gradients, and near vertical flow due to tidal movement in costal works. In the former case it is possible to visualize relatively high rates of flow with correspondingly high seepage velocities, which could induce surface leaching if velocities exceed 5 cm/sec. In the latter case, maximum seepage velocities are of a low magnitude (1 to 2 feet/hr) which is insufficient to cause leaching from a well graded, correctly placed, fluid state concrete. A laboratory experiment to determine degree of leaching at project site velocities is presented. (Smith-NWWA)
W73-12766

GALVANIC CORROSION OF METALS IN CEMENTING MATERIALS,
For primary bibliographic entry see Field 08G.
W73-12775

8G. Materials

TESTS OF SELECTED INSULATING MATERIALS FOR MASS CONCRETE,
Army Engineer, Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08F.
W73-12431

STRENGTH ANALYSIS OF CORNER COLUMN-SLAB CONNECTIONS,
Calgary Univ. (Alberta).
For primary bibliographic entry see Field 08A.
W73-12465

WELDING OF A NORMALIZED HIGH STRENGTH LOW ALLOY PLATE STEEL OF STRUCTURAL QUALITY,
United States Steel Corp., Monroeville, Pa. Applied Research Lab.
W. P. Benter, Jr.
Weld J, Vol 51, No 12, p 591-s-598-s, Dec 1972. 11 fig, 10 tab, 2 ref.

Descriptors: *Welding, *Welded joints, *Structural steel, *High strength steels, Evaluation, Tensile strength, Testing procedures.
Identifiers: Bend tests, Crack propagation, Weldments, Arc welding, Electroslag welding, *Butt joints, Notch tests, Tensile properties, *Low alloy steels, Impact tests, Hardness tests, Tension tests.

Normalized high-strength low-alloy steels are being used to provide structural quality plate steels with improved low-temperature notch toughness for welding applications. Welding characteristics of one such steel are discussed. The investigation covers evaluation of butt welds made by shielded metal-arc, submerged arc, tandem submerged arc, electrogas, and electroslag processes, and includes data on tension tests, guided bend tests, Charpy V-notch tests (base metal, weld metal, and heat-affected zone), and explosion-bulge tests. This steel can be satisfactorily welded with all these processes by using commercially available filler metals, fluxes, and gases, provided low-hydrogen practices are followed. All processes produce butt joints with 100% joint efficiency and satisfactory bend-test ductility. The notch toughness of the weld metal and heat-affected zone, as measured by Charpy V-notch tests and confirmed by explosion-bulge tests of shielded metal-arc, submerged arc, and tandem submerged arc weldments, is excellent. The higher heat input electrogas and electroslag welding processes showed a deterioration of Charpy V-notch properties in the heat-affected zone to the level that would be expected in hot rolled steels of this type. (USBR)
W73-12466

SIMPLIFIED CALCULATION OF EMBANKMENT DEFORMATIONS,
Sydney Univ. (Australia).
For primary bibliographic entry see Field 08D.
W73-12473

TIME EFFECTS ON DYNAMIC SHEAR MODULUS OF CLAYS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02G.
W73-12477

BEARING CAPACITY OF FOOTINGS IN PLANE STRAIN,
Colorado Univ., Boulder.
For primary bibliographic entry see Field 08D.
W73-12484

HIGH STRENGTH BOLTED GALVANIZED JOINTS,
Carleton Univ., Ottawa (Ontario).
D. J. L. Kennedy.
J Struct Div, Am Soc Civ Eng, Vol 98, No ST12, p 2723-2738, Dec 1972. 14 fig, 5 tab, 8 ref, append.

Descriptors: High strength steel, *Joints (Connections), Steel, *Structural steel, Mechanical properties, *Ductility, Foreign research, Failure (Mechanics), Corrosion control, *Steel structures, Protective coatings, Bolts.
Identifiers: *High strength bolts, Galvanized steel, *Bolted joints, Galvanizing, Test results, Stress concentration, Friction coefficient (Mechanical), Fatigue tests, Brittleness, Bolts.

High-strength bolts are the chief mechanical fasteners used for making field connections in steel construction. Behavior of hot dip galvanized high-strength bolted joints under repeated load is discussed. Tests on steel plates without apparent stress concentrations show that hot dip galvanizing reduces the fatigue strength about 4% in zero-to-tension cycles. Galvanizing, in the presence of a notch, in the form of a hole, reduces fatigue strengths by up to 28% at some stress levels in zero-to-tension cycles. Analysis indicates this reduction is caused by loss of ductility of galvanized steel plate compared with as-rolled black plate. Initial coefficients of friction for galvanized plates in these tests were about one half the values for plates with mill scale. Under reversed loading, galvanized joints locked after a few cycles of load, and slip ceased. Because of this action and the fact that fatigue failures of the connections occurred in front of the net section, the fatigue strength of galvanized friction-type connections was comparable to that of identical black connections in zero-to-tension and one-half compression-to-tension cycles. (USBR)
W73-12489

CORROSION BY THE SULPHATE-REDUCING BACTERIA,
University of Manchester Inst. of Science and Technology (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05G.
W73-12756

COMPARISON OF WATERFLOOD CORROSION DETECTION AND MONITORING DEVICES,
Atlantic Richfield Co., Bakersfield, Calif.
R. L. Alvis.
Materials Protection, Vol 8, No 2, p 39-42, February 1969. 4 fig, 2 tab, 1 ref.

Descriptors: *Corrosion, *Oxidation, *Pitting, *Chemical reactions, Wells, Injection wells.
Identifiers: Oxygen scavengers, Membrane type oxygen sensor, Water flood, Corrosion coupons.

Most published information on various corrosion detection and monitoring devices has been derived from laboratory tests. A comparison is presented of 3 methods of corrosion detection and monitoring electrical resistance, polarization rate and coupon analysis used in a California water injection system. Also presented is a case study of the role of D.O. in corrosion and the relative effectiveness of 4 chemical scavengers in the control of D.O. in the system. No single device or technique is totally effective in corrosion detection or monitoring, therefore a combination program tailored to the system is required. (Campbell-NWWA)
W73-12757

SAND CONTROL - 3. CHEMICAL CONSOLIDATION,
Standard Oil Co. of California, San Francisco.
E. B. Rodgers, Jr.
Oil and Gas Journal, Vol 69, No 46, p 152-154, 156, 161, November 15, 1971. 3 fig, 1 tab.

Descriptors: *Aquifer characteristics, Permeability, Cement, *Grouting, Wells, Oil industry, *Hydraulic-fracturing, Hydrostatic pressure, Rock mechanics, Stress, *Chemical reactions.
Identifiers: Well stimulation, *Resin compounds, Organic compounds, *Formation-fracture pressures.

The newest approach to solving the sanding problem in well systems in consolidation, or cementation of the production formation by chemical means. This method began in the late 1940s. While some inorganic methods have been attempted, commercial processes today consist of injecting liquid organic substances (more appropriately called resins than plastics) into the for-

mation where they harden (polymerize) by one of two processes, i.e. preactivation or in situ. Resin characteristics, process classification, process characteristics, factors affecting results and application methods are discussed. Critical to the success of this method is the selection of the resin, and control of the injection pressures to assure proper particle bonding and uniform consolidation for it takes only one unconsolidated preforation to cause a process failure. (Smith-NWWA)
W73-12760

HERE'S A NEW SAND PACK METHOD,
Halliburton Services, Tulsa, Okla.
B. M. Young, J. G. Cook, and A. L. Donaldson, Jr.
Oil and Gas Journal, Vol 67, No 10, p 64-67, March 10, 1969. 3 fig, 2 tab, 7 ref.

Descriptors: *Oil wells, Cement, Grouting, Oil industry, *Chemical reactions, Permeability, Aquifer characteristics, Louisiana.
Identifiers: Resin compounds, Offshore wells, Karpoff, *Well construction.

The resin-sand-pack method is designed to control sand in many of the more difficult cases; long and short intervals in multiple completions, old wells, and in some cases, newly completed zones. It is applicable to all formations that will accept a quantity of sand. In one of the newest developments a small quantity of furan consolidating resin is dispersed in a diesel oil carrying fluid just before or during sand proportioning, (Karpoff's formular for proper sand pack seizing is used). Unlimited placement time is achieved by injecting the oil-catalyst (strong organic acid) solution after final sand placement. Instant resin harding occurs upon contact, yielding short well shut-in times. Resin-sand-pack application has favorable cost effectiveness due to the overall speed of process completion, and no requirement for special down hole equipment. (Smith-NWWA)
W73-12761

MICELLAR SOLUTIONS STIMULATE WELLS,
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W73-12762

CATHODIC PROTECTION FOR COATED STEEL PIPELINES,
Colorado Springs Dept. of Public Works, Colo. Water Div.
E. W. Bailey.
Journal of the American Water Works Association, Vol 63, No 2, p 85-88, February 1971. 3 fig.

Descriptors: *Pipelines, Engineering structures, *Metal pipes, Joints, Linings, *Cathodic protection, Equipment, *Corrosion, *Resistivity, *Colorado.
Identifiers: Dresser couplings, As-built drawings, Sacrificial anodes, Electrical bonding, Colorado Springs (Colo).

Cathodic protection of steel water pipelines, although widely practiced today was not a common practice fifteen years ago. Steel waterpipes installed fifteen or more years ago within the Colorado Springs water system were generally coal-tar coated and lined. A recurring leakage problem in a 75 mile, 30 inch, transmountain diversion pipeline addition to the city's water system, with its associated high repair cost (approx. $1000-2000 per leak), promoted the investigation and eventual installation of cathodic protection for the pipeline. The history and progressive steps of this project are detailed. (Campbell-NWWA)
W73-12765

CORROSION MONITORING METHOD REDUCES EFFECT OF VARIABLES IN ANALYZING OIL FIELD WATERS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
A. C. Nestle.
Materials Protection, Vol 8, No 5, p 49-52, May 1969. 3 fig, 1 tab, 3 ref.

Descriptors: *Corrosion, Wells, Oil wells, On-site tests, Testing procedures, Analytical techniques, *Sampling, *Water analysis, Monitoring.
Identifiers: *Dissolved iron content, Visual comparators, Photoelectric comparators.

Corrosion control trend data can be obtained using an improved method for dissolved iron content testing which includes sampling, sample handling and analysis. Interpretation of trends usually shows either the degree of corrosion control success or the need for further and more specific monitoring. A practical method for analyzing water for dissolved iron is described. The method is based on modified conventional practices and appears to be unique in regard to the reproducibility of results that can be obtained. Procedures for sampling and field and laboratory testing are detailed. (Hunt-NWWA)
W73-12767

CORROSION OF METALS IN TROPICAL WATERS---STRUCTURAL FERROUS METALS,
Naval Research Lab., Washington, D.C.
C. R. Southwell, and A. L. Alexander.
Materials Protection, Vol 9, No 1, p 14-23, January 1970. 11 fig, 4 tab, 13 ref.

Descriptors: *Corrosion, Pitting, Wells, *Chemical reactions, Damages, *Metallurgy, *Saline water.
Identifiers: *Corrosion time curve, Stabilized corrosion rates, *Oxygen diffusion control.

Corrosion data are reported for 20 structural ferrous metals exposed over a varying time period to natural tropical seawaters and fresh waters - situations analogous to those encountered in fluid-zone penetrations experienced in ground water development. Time-corrosion curves derived from both weight loss and pitting are presented for many of the ferrous alloys and tabulated data for all metal environment combinations are included. These comprehensive long term results comprise the most extensive collection of accurate sea water and fresh water corrosion data presently available. After initial periods of changing slopes, corrosion rates for most of the ferrous metals stabilize to constant values. These steady state rates are presented for each exposure and provide a significant means for comparing the corrosion resistance of the different metals in the various environments and for estimating useful life over extended periods. Corrosion curves for eight low alloy steels, Aston process wrought iron, and various cast irons and steels are evaluated against C steel. Marine corrosion in the tropics is compared with available ferrous metal results from temperate latitudes. (Hunt-NWWA)
W73-12772

GALVANIC CORROSION OF METALS IN CEMENTING MATERIALS,
J. W. Pitts.
The Military Engineer, Vol 59, No 387, p 40-41, January-February 1967. 2 fig.

Descriptors: *Corrosion, Damage, *Chemical reactions, *Construction materials, Well casings.
Identifiers: *Galvanic action, Galvanic cell.

Galvanic corrosion of metals embedded in cementing materials is known to have caused failures of steel-reinforced concrete systems containing aluminum conduit and copper tubing. Studies of such failures have led to the understanding of the basic causes of the corrosion, and actions that can be taken to eliminate the problem. A discussion is presented of the cause-effect of this type of corrosion and precautions to be taken during construction to eliminate the problem. (Hunt-NWWA)
W73-12775

PITLESS UNITS AND ADAPTERS,
Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
W. J. Whitsell.
Water Well Journal, Vol 26, No 8, p 34-37, August 1972. 1 fig.

Descriptors: Equipment, *Wells, *Water wells, *Corrosion, Well casing, Metallurgy, Metals, Materials.
Identifiers: Electrolytic corrosion, *Pitless adapters, Positive pressure conditions, Negative pressure conditions.

Because of the pollution hazards involved, many states prohibit the use of a pit house. A commercially available unit known as a pitless adapter eliminates the need for a well pit. A specially designed connection between the underground horizontal discharge pipe and the vertical casing pipe makes it possible to terminate the permanent watertight casing of the well at a safe height above final grade. The underground section of the discharge pipe is permanently installed eliminating the need for attention during maintenance operations. A discussion is presented of advantages and installation procedures for pitless adapters. (Hunt-NWWA)
W73-12776

GUIDE SPECIFICATION FOR CHEMICAL GROUTS.
American Society of Civil Engineers, New York. Committee on Grouting.

Journal of Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 94, No SM2, p 345-352, March 1968.

Descriptors: *Chemical grouting, Wells, Groundwater, *Grouting.
Identifiers: Cementing specification, Aquifer protection, *Water well construction.

Specifications are provided for chemical grouts which are intended to make it possible for the project engineer to obtain the chemical or chemicals desired, and to effect grouting operations intended with these materials. For the purpose of these specifications, grouts are considered to be any material which may be pumped or placed into voids in a formation to change the formation properties. Chemical grouts are defined as true solutions, which contain no suspended particles unless those are deliberately added for some specific purpose. (Campbell-NWWA)
W73-12782

FUNGI COLONIZING WOOD SUBMERGED IN THE MEDWAY ESTUARY,
Aberdeen Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 02L.
W73-12825

8I. Fisheries Engineering

INVESTIGATIONS ON AMERICAN SHAD IN THE ST. JOHNS RIVER,
For primary bibliographic entry see Field 02H.
W73-12370

PRELIMINARY STUDY OF SABLEFISH CULTURE, A POTENTIAL NEW INDUSTRY,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.

W. A. Kennedy.
J Fish Res Board Can. Vol 29, No 2, p 207-210. 1972. Illus.
Identifiers: Anoplopoma-Fimbria, *Fish industry, *Sablefish culture, Fish rearing.

A new industry may be possible based on capture of 2nd-year juvenile sablefish (Anoplopoma fimbria) weighing about 300 g then rearing them to 4 kg for sale. Sablefish were easy to rear. Under growth-favoring conditions they gained about 150 g/fish/mo., used about 5 kg wet weight of feed/kg gained, and had mortalities of less than 1%/mo. Concentrations of at least 43 kg of fish/m2 or 70 g/l did not adversely affect growth or mortality.--Copyright 1972, Biological Abstracts, Inc.
W73-12373

A PILOT FISH-POND SYSTEM FOR UTILIZATION OF SEWAGE EFFLUENTS, HUMBOLDT BAY, NORTHERN CALIFORNIA,
California State Univ., Humboldt, Arcata.
For primary bibliographic entry see Field 05D.
W73-12434

REARING CHANNEL CATFISH FINGERLINGS UNDER INTENSIVE CULTURE CONDITIONS,
Skidway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, T. Murai, and G. O. Gibbons.
Prog Fish-Cult. Vol 34, No 2, p 100-102, 1972. Illus.
Identifiers: *Ictalurus-Punctatus, *Rearing (fish), Tank cultures (Fish), *Channel catfish, *Catfish (Fingerlings).

Data obtained from rearing channel catfish (Ictalurus punctatus) fingerlings at three stocking densities under intensive tank culture conditions indicated that a stocking density which will yield approximately 1 lb/cf when the fish reach an average weight of 1/2 oz is desirable. A higher density (1.5 lb/cf (ft3)) resulted in considerably reduced growth rates, whereas growth rates at a lower density (0.5 lb/cf) were not substantially more rapid than that of fish reared to 1 lb/cf, until the desired maximum densities were approached.--Copyright 1972, Biological Abstracts, Inc.
W73-12488

THE AFRICAN GREAT LAKES FISHERIES: PAST, PRESENT AND FUTURE,
Food and Agriculture Organization of the United Nations, Jinja (Uganda). Lake Victoria Fisheries Research Project.
P. B. N. Jackson.
Afr J Trop Hydrobiol Fish. Vol 1, No 1, p 35-49. 1971.
Identifiers: *Africa, Alestes-imberi, Alestes-lateralis, Bagrus, *Fisheries, Great, Haplochromis, Lakes, Lates-niloticus, Management, Tilapia.

Earliest African fisheries were by waterside peoples using locally fabricated materials. Seine nets of woven twine, of Arabian origin, were later introduced. Gill-nets were introduced in 1905 and remain the most widely used gear. Tilapia species, all inhabiting inshore waters, remain the most important fish caught, but catches generally continue to decline. Further basic studies on Tilapia are necessary to improve management. Large boats with power-operated gear are an important recent innovation which may supplant canoes and gill-nets as producers of the main catch in large lakes, but for success require careful economic planning due to the high initial cost of vessels and essential shore installations. There are numerous management problems e.g. Labeo being heavily fished on spawning migrations, the capture of juvenile Bagrus while fishing for Haplochromis, or of Lates while fishing for clupeoids. Lates niloticus introduced to Lake Victoria have not succeeded so quickly as in Lake Kyoga, due probably to the young competing for food with Haplochromis species. The newcomer Alestes lateralis has supplanted A. imberi in Lake Kariba, through having a more extended spawning season.--Copyright, 1973, Biological Abstracts, Inc.
W73-12646

USE OF COLD BRANDS ON CHANNEL CATFISH,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
J. L. Brauhn, and J. W. Hogan.
Prog Fish-Cult, Vol 34, No 2, p 112, 1972.
Identifiers: *Channel catfish, Ictalurus-punctatus, Catfish, Cold brands, *Marking (Fish branding).

Liquid N was used to cool silver-tipped branding tools for marking individual adult channel catfish (Ictalurus Punctatus). Mark retention was excellent for 60 days. Legibility decreased thereafter until some types of numerals could not be identified at 120 days after branding. The technique is most useful for short-term research, but simple marks could be applied for population studies up to 365 days in length.--Copyright 1972, Biological Abstracts, Inc.
W73-12778

CONVERSION, MAINTENANCE AND ASSIMILATION FOR WALLEYE, STIZOSTEDION VITREUM VITREUM, AS AFFECTED BY SIZE, DIET AND TEMPERATURE
Ministry of Natural Resources, Port Dover (Ontario).
J. R. M. Kelso.
J Fish Res Board Can. Vol 29, No 8, p 1181-1192. 1972. Illus.
Identifiers: Amphipods, Assimilation, Conversion, Crayfish, Diet, Maintenance, Size, Stizostedion-Vitreum-Vitreum, Temperature, *Walleye, *Fish management.

An optimum ration was not readily apparent as conversion differed only slightly at high and low rations. Gross (K1) and net (K2) conversion was affected by neither ration size nor temperature, but decreased with increasing fish size. Conversion of the 3rd order (K3) was affected only by temperature, being greater at higher temperatures. Gross and net conversion were consistently lower at cycled temperatures, 16-8C. Gross and net conversion were similar since the high assimilation efficiency (82.1-97.9%) of S. vitreum vitreum did not greatly alter the latter. Assimilation efficiency was dependent upon diet type, least for invertebrates (82.1% for amphipods and 83.5% for crayfish) and greatest for fish (96.9% for age O perch and 97.9% for emerald shiners). Assimilation efficiency decreased with increasing walleye size (slope of -0.0045) irrespective of the food organism. Regurgitation of crayfish occurred in 2 of 3 trials, and it was not established if this was a natural phenomenon. Maintenance requirement per gram was independent of fish size, but was affected by temperature. Maintenance between temperatures of 4-12C was similar, 33.3-45.7 cal/g walleye/wk, but increased greatly above 12C. Results from maintenance experiments paralleled Winberg's (1969) approximation of routine metabolism.--Copyright 1973, Biological Abstracts, Inc.
W73-12832

PREDATION BY RAINBOW TROUT (SALMO GAIRDNERI): THE INFLUENCE OF HUNGAR, PREY DENSITY AND PREY SIZE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. M. Ware.
J Fish Res Board Can. Vol 29, No 8, p 1193-1201. 1972. Illus.
Identifiers: Density, Hunger, *Predation, Prey, *Rainbow trout, Salmo-Gairdneri, Size, Trout.

The feeding behavior of rainbow trout (S. gairdneri) was investigated by exposing fish to several densities and sizes of prey over a range of 4 substrates of varying complexity. Within substrate treatments the rate of predation could be stimulated by increasing either prey density, prey size, or predator hunger. Between treatments, however, both the intensity of predation and total food consumption proved to be inversely related to the complexity of the substrate because a number of prey were able to find cover and thus escape detection. The results further indicate that the nature of foraging behavior may be controlled by a critical rate of food capture. If trout did not exceed an average of .058 captures sec-1, substrate-oriented search proceeded to wane.--Copyright 1973, Biological Abstracts, Inc.
W73-12836

DESIGN OF TRAPNET WITH INTERCHANGEABLE PARTS FOR THE CAPTURE OF LARGE AND SMALL FISHES FROM VARYING DEPTHS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
R. J. Beamish.
Journal of the Fisheries Research Board of Canada, Vol 30, No 4, p 587-590, April 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Fishing gear, *Freshwater fish, *Marine fish, *Design, *Fabrication, Depth, Brook trout, Rainbow trout, Walleye, Yellow perch.
Identifiers: *Convertible trapnets, *Trapnets, Wolf Lake, White sucker, Common shiner, Redbreast sunfish, Brown bullhead, Southern redbelly dace, Cutlips minnow, Creek chub, Blacknose dace, Slimy sculpin, Lake whitefish, Arctic char, Smallmouth bass, Northern pike, Salvelinus alpinus, Coregonus clupeaformis, Salmo gairdneri, Micropterus dolomieui, Esox lucius, Stizostedion vitreum vitreum, Perca flavescens.

A new design is described for a convertible trapnet that is effective in catching small and large fishes in depths ranging from 3 to 15 ft (1-5 m). The nets are constructed from 1/32-inch (0.8-mm) square mesh, green mosquito-type nylon netting. Details of construction are included. Three designs have been successfully tested: (1) a basic 3-ft design, weight 31 lb; (2) a 9-ft net, weight 48 lb, that converts to the basic 3-ft design, and (3) a 6-ft net, weight 35 lb, that is similiar to the 9-ft model but reduced in proportions and not convertible. These three designs when fished in Wolf Lake (New York) captured nine of the ten species reported to be present. Trapnets of similar design have captured many other species of small and large freshwater fishes including arctic char, lake whitefish, rainbow trout, walleye, and yellow perch. They have also fished successfully in some marine habitats. (Holoman-Battelle)
W73-12899

THE GROWTH, REPRODUCTION AND FOOD OF THE ROACH RUTILUS RUTILUS (L.), OF THE RIVER LUGG, HEREFORDSHIRE,
Freshwater Biological Association, Wareham (England). River Lab.
J. M. Hellawell.
J Fish Biol. Vol 4, No 4, p 469-486, 1972, Illus.
Identifiers: *England, Growth, Herefordshire, Insect, Lugg, Molusks, Reproduction, River, *Roach, Rutilus-Rutilus, Vegetation, *River Lugg.

Checks were formed on the scales in June and July. A dominant 1959 year class accounted for half the population present in 1964. Females grew faster than males and attained greater ultimate size. Growth in the River Lugg was good in comparison with rates in other British waters. The sex ratio was found to change with age; a predominance of males in the youngest age classes changed to a preponderance of females in the older classes. The youngest fishes caught (3+) were already sexually mature. The gonads were a constant proportion of the body weight for fishes

of all sizes at a given season. Spawning was completed by June; males were ripe in May. The ovaries recovered more rapidly than the testes after spawning. Seasonal variation in feeding activity, with higher activity in summer, was observed and could be correlated with temperature. Seasonal changes in the diet could be related to availability. The diet was predominantly vegetable; the most important animal component, aquatic insect larvae, accounted for 11% of the total diet. Aerial insects were rarely eaten. Diet varied with age: molluscs being particularly important to older roach; younger roach consumed large amounts of substrate material. There is some evidence that young roach indiscriminately ingest substrate material but older roach are more selective and reject inert material.--Copyright 1973, Biological Abstracts, Inc.
W73-12921

PRIMARY PRODUCTIVITY IN A NEW AND AN OLDER CALIFORNIA RESERVOIR,
California State Dept. of Fish and Game, Sacramento.
L. L. Chamberlain.
Calif Fish Game. Vol 58, No 4, p 254-267, 1972.
Identifiers: *California, Carbon-14, *Fish populations, Fishery management, *Primary productivity, Reservoirs.

The sport fishery in new reservoirs often reaches a peak and then undergoes a marked decline a few years following impoundment. One theory attributes such declines to diminishing basic fertility. To test this theory, primary productivity in a new reservoir was measured by the C14 method for 4 yr. An older reservoir served as a control. High initial rates of C fixation in the new reservoir, attributed to flooding of organic material, were transitory. Subsequent patterns of primary productivity were similar in the 2 waters. Increases in primary productivity in both reservoirs were associated with establishment of planktivorous fish populations and demonstrated that declining primary productivity is not as inevitable result of initial reservoir aging.--Copyright 1973, Biological Abstracts, Inc.
W73-12998

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

ENCOURAGE APPLIED RESEARCH AND PUBLISH THE FINDINGS,
Minnesota Mining and Mfg. Co., St. Paul.
For primary bibliographic entry see Field 05G.
W73-12758

10C. Secondary Publication And Distribution

GROUND WATER POLLUTION IN THE SOUTH CENTRAL STATES,
Robert S. Kerr Environmental Research Lab., Ada, Okla. National Ground Water Research Program.
For primary bibliographic entry see Field 05B.
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HORTON'S 1945 STUDY: A CARTOBIBLIOGRAPHY,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 07C.
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BIOLOGICAL EFFECTS OF ARTIFICIAL DESTRATIFICATION AND AERATION IN LAKES AND RESERVOIRS-ANALYSIS AND BIBLIOGRAPHY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-12625

BIOLOGICAL EFFECTS OF OIL POLLUTION - SELECTED BIBLIOGRAPHY II,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 05C.
W73-12626

BIOLOGICAL ASPECTS OF LEAD: AN ANNOTATED BIBLIOGRAPHY - LITERATURE FROM 1950 THROUGH 1964. PARTS I AND II,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 05C.
W73-12627

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL 1 - CHEMISTRY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12753

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL II - BIOLOGY,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12754

ANNOTATED BIBLIOGRAPHY OF LAKE ONTARIO LIMNOLOGICAL AND RELATED STUDIES - VOL III - PHYSICAL,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 02H.
W73-12755

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION.
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02A.
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10F. Preparation of Reviews

WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. I. GENERAL AND IN-PLANT MODIFICATIONS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
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Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05A.
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Institute of Paper Chemistry, Appleton, Wis.
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WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. A. PHYSICAL OPERATIONS,
Institute of Paper Chemistry, Appleton, Wis.
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Institute of Paper Chemistry, Appleton, Wis.
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WATER POLLUTION IN THE PULP AND PAPER INDUSTRY. IV. TREATMENT METHODS. C. CHEMICAL PROCESSES, GENERAL OBSERVATIONS, AND REPORTS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 05D.
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ANNUAL LITERATURE REVIEW: ADMINISTRATION, SYSTEMS ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05G.
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THE NITROGEN CYCLE IN SEDIMENT--WATER SYSTEMS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
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MSU/AEC Plant Research Lab., East Lansing, Mich.
For primary bibliographic entry see Field 05C.
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CARBON CYCLE IN SEDIMENT-WATER SYSTEMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
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TOTAL MERCURY ANALYSIS: REVIEW AND CRITIQUE,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05A.
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PHOSPHATE CHEMISTRY IN LAKE SEDIMENTS,
Massey Univ., Palmerston North (New Zealand).
For primary bibliographic entry see Field 05C.
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For primary bibliographic entry see Field 05A.
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W73-12549 5G

Large Surface Aerator Designed to Condition Board Mill Effluent.
W73-12550 5G

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A. Centers of Competence		
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W73-12616 -- 12631 12841 -- 12843 12845 -- 12855 12857 -- 12862 12864 -- 12883 12885 -- 12887 12889 -- 12913 12915 -- 12920 12922 12924 -- 12932 12935 -- 12938	104
Bureau of Reclamation, Engineering Works	W73-12463 -- 12487 12489 -- 12490	27
Cornell University, Policy Models for Water Resources Systems	W73-12711 12839 -- 12840	3
Institute of Paper Chemistry, Water Resources of Pulp and Paper Industry	W73-12524 -- 12538 12540 -- 12558 12672 -- 12674	37
National Water Well Association, Water Well Construction Technology	W73-12756 -- 12762 12764 -- 12773 12775 -- 12777 12779 -- 12783	25
University of Arizona, Arid Land Water Resources	W73-12403 -- 12408 12785 -- 12797	19
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B. State Water Resources Research Institutes		
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South Carolina Water Resources Research Institute	W73-12498	1
Texas Water Resources Institute	W73-12353 -- 12354	2
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Wisconsin Water Resources Center	W73-12355	1
C. Other		
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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Subject Fields

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- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
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